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DIAGNOSIS AND MANAGEMENT OF ACUTE SMALL BOWEL OBSTRUCTION*

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ACUTE SMALL BOWEL OBSTRUCTION is a problem of great complexity, not fully understood even with our great advances in anatomy, physiology, biochemistry, bacteriology, and surgery. Lives are saved which, fifty years ago, would have been lost due to this devastating disease. Thousands of articles and hundreds of books have been written on the subject. This extensive investigation has resulted in great progress in the diagnosis and management of acute small bowel obstruction.

Prior to 1800, clinicians were totally ignorant of even the fundamental problems encountered in this disorder. Since then, the concepts relating to bowel obstruction have developed along three lines. The first of these is the study of the anatomy and pathology of obstruction and the relation of these to the clinical picture. Thus a valid and clear classification came into being. Secondly, in the late nineteenth and early twentieth centuries, a study of the toxic factors involved advanced the understanding of the problem. The third phase was the acquisition of knowledge of the biochemical and physiologic alterations in the blood and body fluids.⁸

Concomitant with these highly significant advances in the basic sciences was the development of abdominal surgery, first in technical methods, then in the all-important ancillary fields closely related to surgical practice which have increased the scope of surgery. Many of the great names in surgery are seen in the writings on this subject. It is our purpose to discuss the diagnosis and management of acute small bowel obstruction in the light of present-day knowledge.

In establishing the diagnosis a careful history is essential. One can, with surprising frequency, localize the site and determine the exact cause of the obstruction on the basis of history alone. Basically, a story of pain, vomiting, and distention, is highly suggestive of an obstructive process occurring within the intestinal tract. They may occur alone or in combination.

The pain is usually of sudden onset, although it

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may vary in this respect. It is colicky, occurring in paroxysms followed by intervals that are asymptomatic. As time passes, the pain becomes more intense and the bouts of colic begin to occur more frequently. It may be localized at the site of the obstruction but more often is generalized. The persistence of the pain between attacks suggests the onset of strangulation obstruction.

The vomiting usually begins shortly after the start of the pain. It is present early in upper, small bowel obstructions, but occurs later if the lower small bowel is involved. One must determine its frequency, amount, and character, and its effect upon the patient. A greenish or brownish-green vomitus is seen in jejunal obstructions, whereas it is foul and feculent in the ileal type. At the outset, the vomitus is profuse but may decrease later as the illness progresses. It is estimated that about four liters may be lost in the first thirty-six hours of the disease. The frequency of vomiting is quite variable and has little or no relation to the type of obstruction. However, knowledge of the degree of vomiting is important in making a preliminary estimate of the patient's state of hydration.

The third of the symptoms; distention, is variable, and usually occurs rather late in the disease. It may be absent if the obstruction is high, but is seen to a greater or lesser degree if the obstruction is low.^{2,9}

While the three above-mentioned symptoms are the most important and crucial in diagnosis, there are other factors to be considered. A change in bowel habits is occasionally noted but is variable and inconstant. Low small bowel obstructions may show a minor degree of constipation. However, a slight diarrhea may be seen in an early case. Often no change occurs. The type and location of any previous surgery is noted. A history of abdominal or pelvic inflammation is sometimes obtained, such as in diverticulitis or pelvic inflammatory disease. A history of previous gallbladder disease is occasionally elicited in a case of gallstone ileus. Quite often a long-standing external hernia has been noted. Previous heart disease, auricular fibrillation, or myocardial infarction may lead one to consider a mesenteric thrombosis. Weight loss or vague digestive complaints may be seen in a case of small

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bowel tumor. A complete system review, social and family history may yield useful information.

On physical examination one notes the state of hydration, the presence of edema, or gross color change of the skin. Loose skin, pallor, enophthalmos and dry tongue signify dehydration. One may hear fine rales at the lung bases secondary to elevation of the diaphragms by distention. Auscultation of the heart may reveal abnormal rhythms or murmurs of cardiac disease which point to mesenteric vascular accidents.

The abdomen is carefully palpated for areas of tenderness and spasm suggesting an inflammatory etiology of the obstruction, or a possible site of strangulation. Gross distention is noted. Each of the hernial orifices is carefully examined, since an incarcerated or strangulated hernia may be obscured by subcutaneous fat. Hernia is among the commonest causes of small bowel obstruction. An incarcerated femoral hernia may be difficult to diagnose, and if missed, lead to disaster.

Auscultation of the abdomen reveals the typical high-pitched bowel sounds occurring in rushes and reaching a peak at the height of the patient's pain. In the later stages of the disease, the abdomen becomes silent. Occasionally, hyperperistalsis may be heard without the aid of a stethoscope. The succussion splash of air-fluid levels in distended bowel is sometimes heard.

Temperature is normal early in the disease, and in the uncomplicated case seldom rises more than a degree or two. An elevation to 101° or more is highly suggestive of strangulation obstruction. A rise in pulse, a drop in blood pressure, and the other signs of shock will follow. Rectal and pelvic examination may disclose inflammatory masses, local tenderness or bloody stool, as is seen in mesenteric vascular catastrophes or in intussusception.

Laboratory studies are required both for diagnosis and management. A plain X-ray film of the abdomen is obtained in both the recumbent and upright positions. The former is more satisfactory for showing distended loops of bowel. In the early case, an *isolated* loop or two will be seen, while the typical "step-ladder" pattern is seen in late cases. An upright film is useful in outlining air-fluid levels and, by change in position, may bring into view distended loops not seen in the recumbent film. The upright film is also useful in detecting pneumoperitoneum due to perforation of bowel. If one suspects this, the patient can be kept in the upright position for several minutes to allow any air to migrate upward. A chest film is also taken at this time in order to detect any disease in either heart or lungs.

X-ray studies are useful in establishing the existence, location, degree and complications of intestinal obstruction and in observing the progress of

the treatment. This holds true, however, only in conjunction with a careful history and physical examination. The information given by the films can be quite misleading without them.⁶

The jejunum can be recognized by its greater caliber, thicker wall, and better developed plicae circulares, as contrasted to the narrower, thinner-walled ileum with its fewer plicae proximally and absence of them distally. X-ray studies will not detect strangulation or mesenteric vascular occlusion. Closed loop obstruction may be manifested either as an air-filled loop or a fluid-filled loop, the latter described as a pseudotumor. Certain signs are highly suggestive of strangulation obstruction. The important radiological signs of strangulation obstruction are as follows: gas in two distended limbs of a loop of bowel separated by apposed walls, edematous and thicker than normal — the so-called "coffee-bean" sign; an oval soft tissue density producing a pseudotumor; and fixation of the involved loop. Other signs are a smooth lumen due to loss of the plicae configuration, scarcity of gas above the involved loop, and inability to decompress a single loop with a tube. Long fluid-levels, excessive fluid and greatly distended solitary segments have also been considered suggestive of strangulation.¹⁰

A white blood cell count of 15,000 and below is usual in simple obstruction. A count above 18,000 is indicative of a strangulation obstruction. Extremely high values — of the order of 30,000 to 50,000 — are seen in mesenteric thrombosis. The hematocrit is normal in the early phase, then rises as the dehydration due to vomiting and loss of fluid into the bowel lumen supervenes. A urinalysis may detect occult renal disease and will also show ketosis and acidosis if present.^{2, 9}

Blood chemistries are taken as base-line studies before fluid therapy is begun. The tests most commonly used are the blood urea nitrogen, sodium, potassium, chloride, and carbon dioxide combining power.

Treatment should be carried out in a well-organized manner. Although each phase will be discussed individually, in practice they are carried out simultaneously. The management regime consists of decompression, fluid and electrolyte replacement, blood and plasma replacement, surgical attack upon the cause of the obstruction or the removal of the obstructed segment of bowel.

A most important factor in reducing the mortality of intestinal obstruction has been the effective use of intubation and decompression. This maintains the viability of the bowel, helps to restore its function, and reduces the risk of subsequent operation.¹⁶ Bowel gas, mainly swallowed air, is removed; fluid is collected; and its amount is accurately measured for purposes of replacement. There

has long been a debate over the use of the long versus the short tube. The latter effectively decompresses the stomach, but does not remove fluid and gas beyond the pylorus. However, it does reduce the amount of swallowed air which, if allowed to remain, may add to the severity of the obstruction. The long tubes, such as those of the Miller-Abbott, Harris, or Cantor type, have value in relieving distention. Although many techniques have been devised to facilitate passing the tube beyond the pylorus, this still remains a difficult problem. Close fluoroscopic control is needed, but, even with this, the effort is frequently met with failure. Assuming the tube is successfully passed, it will act as a bolus and progress of its own accord, removing gas and fluid as it goes. Deflation of the stomach and duodenum alone will often decompress the small bowel. Occasionally, when the obstruction is due to kinking by adhesions and is perpetuated by distention, decompression alone may relieve it. In the usual case, the use of the tube alone has been reserved for simple recurrent obstructions due to adhesions or to metastatic carcinoma, when strangulation is not a factor.^{11, 15, 16, 17, 18}

The use of a long or a short tube, as a general rule, should be subordinate to operative decompression or removal of the obstructive mechanism. The short, or Levin tube, is usually adequate in preliminary management, to check accumulation of air and vomiting.

As soon as the diagnosis is made, a Levin tube is passed and suction is instituted. It is kept at 80 to 100 millimeters of mercury negative pressure. The tube is irrigated frequently with normal saline to insure its patency. Certain points must be kept in mind in managing the tube. The mouth must be carefully attended to because the presence of the tube in the nose causes mouth breathing and often results in a stomatitis. The moisture of the oral mucosa must be maintained by frequent mouth washes and the use of hard candies, lest surgical parotitis, a disastrous complication, supervene. The presence of the tube makes coughing rather ineffective with a resulting significant increase in pulmonary complications; these must be recognized and vigorously treated. Esophagitis is another possible complication. The tube should be removed as soon as the obstruction is corrected and normal peristalsis restored. The net physiologic effect of intubation and suction is a subtraction alkalosis and increased dehydration, for which appropriate fluid replacement is necessary. Thus, effective use of the tube requires the recognition of its shortcomings and the minimizing its complications.¹¹

When efficient suction has been instituted, the correction of the fluid and electrolyte imbalance caused by the obstruction is undertaken. Basically,

the functional extracellular and circulating blood volume and blood pressure must be maintained so as to support the normal perfusion and function of the kidneys, heart, and brain; and also to restore gradually the lost fluid and electrolyte. Salt and water depletion by loss into the lumen of the distended bowel and removal by vomiting or aspiration threaten the extracellular fluid volume.¹¹

Salt replacement must not await the results of the initial blood chemistries. If possible, the patient's weight is taken and recorded. A catheter may be inserted into the urinary bladder to facilitate the measurement of urinary output. An intravenous drip is started using 1,000 ml. of 5% dextrose in saline followed by 1,000 ml. of 5% dextrose in water with 40 milliequivalents of potassium chloride. This fluid should be given rapidly — at about ten milliliters per minute — over a three-hour period. Its effectiveness should be indicated by a rise in urinary output to an ideal of 25 to 50 milliliters per hour. Usually the output rises and thus minimizes any risk of potassium intoxication. During this resulting period the laboratory results will have been reported, and it is then possible to reassess the situation and readjust the fluids according to the needs presented by the case.

Moore has suggested the use of a "balance regimen" which, in effect, is a recorded summation of all the chemical and physiologic factors involved in the management of a bowel obstruction. It employs the frequent determination of blood electrolytes, careful computation of intake and output, recording of weight, frequent review of the hematocrit to act as a guide to the state of hydration, and such other studies — calorie charts, adrenal function tests, etc. — as may be useful in the total care of the patient. Fluid and salt losses are carefully replaced according to need.¹¹ Blood for typing and cross-matching is drawn as the patient is made ready for surgery.

When strangulation obstruction is diagnosed or suspected, further measures are essential. If the patient is in shock, blood and plasma must be given in addition to other fluids. Antibiotics are used in adequate doses to combat perforation and peritonitis. It has been found that these measures have a definitely favorable influence on survival.¹³ Surgery should be performed as soon as possible, even while the resuscitative measures are being carried out. It should be kept in mind that strangulation is much more common in small bowel than in large bowel obstructions. In such cases conservative therapy may mask the presence of strangulation. Strangulated external herniae are often the cause of small bowel obstruction in elderly patients. In these cases immediate surgery should be performed. Concomitant illness is not a contraindication since delay can be extremely hazardous.^{3, 4}

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After the patient has been prepared, the next phase in management is surgical. Whatever the cause of the obstruction, the aims of surgery are as follows: to release the obstruction, to re-establish the bowel continuity, and to resect any non-viable bowel.^{3, 11} It is not within the scope of this paper to go into the individual procedures involved or the various technical details, except in the most general of terms. The exact procedure employed depends upon the cause of the obstruction and the preference of the surgeon. If the cause is an incarcerated hernia, the involved bowel is replaced in the abdomen, or resected if strangulation is present, following which the hernia is repaired. In the case of adhesions, following careful inspection of the small bowel, lysis of adhesions is performed. The procedure employed depends upon the cause, whether it be tumor, inflammation, intussusception, polyp, gallstone, or foreign body. If there is any doubt as to the viability of the bowel, resection should be performed. The mortality is closely related to the extent of the surgery — the longer the operation, the higher the mortality. The surgery should be adequate, meticulous, and complete, yet done with dispatch. Following surgery the patient will continue to be quite ill, and intensive care should not be relaxed until the patient is having normal peristalsis and is taking oral alimentation.⁹

In most cases of obstruction, especially in the presence of strangulation, with the patient desperately ill, possibly in shock, and acutely dehydrated, the anesthesia of choice is general anesthesia with endotracheal intubation, utilizing adequate oxygenation and vigorous supportive therapy.

Following surgery, attention is again directed toward hydration and electrolyte replacement. The balance regime, outlined above, is maintained. Intake and output is carefully recorded to serve as a guide to fluid replacement. Antidiuresis and physiologic conservation of salt in the immediate post-operative period require cautious use of salt at this time. However, by the second day, attention is again turned toward salt replacement. Blood electrolyte studies determine the amounts of water, sodium, potassium, and chloride to be given, together with the urine output, insensible losses due to perspiration, and respiration, and basic body needs for water. Fluid requirements are calculated daily. Routine daily intravenous fluid orders must be condemned. In the usual case, 2,500 to 3,000 ml. per day of total fluid are sufficient, but if losses are excessive, more fluid will have to be given. Blood and plasma should be used whenever necessary to restore the osmolarity and the oxygen-carrying capacity of the blood. When strangulation has occurred, postoperative antibiotics, usually a combination of penicillin and streptomycin in large doses, are employed.¹¹

The intestinal or nasogastric tube is kept on suction and is managed as outlined above. Coughing is encouraged and aided to prevent atelectasis, pneumonia, or aspiration. Endotracheal suction is used as necessary. The legs are wrapped in elastic bandages or stockings, and movement is encouraged to prevent thrombo-embolism. The patient is ambulated as soon as possible.

These measures are effective in reducing post-operative morbidity and mortality. Therapy is directed toward restoration of normal body function. When normal peristalsis resumes, diet is instituted, progressing from liquids to a normal food intake.

The mortality of bowel obstruction has improved — now of the order of 10% — but should be lower. Early surgery, within the first twenty-four hours of the disease, will keep the mortality low. After this time it rises markedly. Early diagnosis and prompt therapy are of paramount importance in keeping the mortality at a minimum.

Acute small bowel obstruction in children presents somewhat different problems. The disease has a considerable mortality in extreme youth for several reasons, among them being the inability of the child to tolerate severe dehydration and the presence of congenital anomalies, which often are multiple and compound the therapeutic problem. The diagnostic procedures are the same as in the adult case. The types of obstructions vary with age. In the neonatal period the causes are usually congenital stenosis and atresia, meconium ileus, a manifestation of mucoviscidosis, and malrotations. The symptoms appear in the first days of life and are characterized by vomiting and distention. Forty per cent of these occur in premature infants. The vomiting occurs from the first feeding, and dehydration is rapid. Typically the X-ray picture shows distention of the stomach and proximal small bowel up to the obstructed area, or in meconium ileus many dilated loops of small bowel filled with granular clumps.

Obstructions in older children are due to enteric duplications, intussusception, herniae, and omphalomesenteric duct anomalies. The attack in these cases begins with pain and is manifested by intermittent irritability and crying. Intussusception is sudden in onset, and usually occurs in previously healthy and robust male infants, most frequently between the ages of four and twenty-four months. 70% of cases are ileocolic. The X ray in most cases will show the picture of small bowel obstruction.

Management consists of fluid and electrolyte replacement, often through a catheter in a leg vein, transfusion, antibiotics when necessary, and intestinal decompression by a small tube, followed by definitive surgery. The operative procedure varies with the cause of the obstruction. In atresia, anasto-

mosis — end-to-end or side-to-side — is done with a tube enterostomy for postoperative decompression. Reduction of intussusception by barium enema is possible in over 80% of cases and should be attempted prior to surgery. Duplications are resected; malrotations are corrected; herniae are repaired.^{5, 12, 14}

Fluids should be given carefully, it has been found that slight undertreatment is better than too vigorous replacement with the concomitant risk of circulatory overload or water intoxication. Careful monitoring of electrolyte values and intake fluid volumes is necessary. The general principles of fluid therapy, as outlined above, apply in this situation. When therapy is successful, recovery is prompt. The adverse effect of cardiac and renal defects, multiple atresias, and vascular anomalies must be kept in mind. They are a highly significant factor in the still high mortality, often over 50%, in intestinal obstructions in newborn children.

Another problem to be considered is acute small bowel obstruction in the postoperative patient. The symptoms and signs are slight or even totally absent. They may be mistaken for the usual postoperative pain and distention. Among the causes are generalized adhesions, adhesions at the operative site, intestinal incarceration in peritoneal defects such as pelvic floor disruptions after abdomino-perineal resections, wound disruptions, unclosed lateral gutters, internal hernias due to unclosed mesenteric defects, and failure of anastomotic function. Mechanical rather than paralytic ileus is suggested by abnormal distention occurring late in the postoperative period, profuse vomiting, or profuse nasogastric tube drainage. The pain is rhythmic and of greater severity than in paralytic ileus. The X-ray picture is suggestive of mechanical obstruction if no large bowel gas is seen in the presence of distended small bowel. In paralytic ileus, the picture is one of distention of both large and small bowel. However, it must be emphasized that frequently the differentiation cannot be made by X ray. The diagnosis must often be made on clinical evidence alone, and may be extremely difficult.^{11, 7}

Paralytic ileus is usually characterized by less vomiting, less pain, higher fever, fewer or no cramps, and complete lack of bowel sounds. Careful and repeated examinations of the patient are necessary for differential diagnosis because of the atypical picture so often presented.

The balance regimen respecting fluid and electrolytes again is followed. Blood and plasma may be needed because of depletion of the red cell volume and protein supply by the preceding illness. Intubation followed by surgery is again indicated.

If the diagnostic is unclear, management often is conservative with the use of fluids and tube de-

compression, in the absence of rising temperature and pulse, elevation of the base-line white blood cell count, or the signs of impending shock suggesting strangulation. Hasty surgery, done for paralytic ileus, will make the patient much sicker than before. If, however, the patient has been decompressed but is still clinically obstructed after fourteen days of therapy, surgery is indicated because then mechanical factors are most likely.¹¹ Intra-abdominal abscess or other acute inflammatory disease — acute appendicitis, acute cholecystitis — must also be considered as etiologic factors.

Postoperative distention, pain, vomiting, dehydration, electrolyte imbalance, and a suspicious X ray, may be caused by an intra-abdominal inflammatory process. The pain is usually not colicky; the process develops slowly; the diagnosis may be obscure; and the appearance may be that of an adynamic ileus. Careful evaluation of the patient should reveal the true cause. Localized tenderness, a rise in white count, and signs of increasing toxicity will indicate that surgery should be performed. Ureteral stone, retroperitoneal disease, aneurysm, and pulmonary disease should be considered.

SUMMARY

It has been the purpose of this paper to discuss the special problems involved in the diagnosis and management of acute small bowel obstruction. These factors have been dealt with in detail. Early diagnosis and a clear visualization of the pathologic processes involved are of great aid in subsequent management.

Fluid and electrolyte replacement has been discussed in a practical, clinically applicable manner. The use and abuse of intestinal decompression has been discussed. Surgery of the disease has been outlined as to its aims and principles, applicable to all clinical situations. Special problems, such as postoperative obstruction, obstructions in children, and conditions which may simulate small bowel obstruction, such as intra-abdominal inflammation or vascular catastrophes, have been discussed. All factors which enable one effectively to treat a case of acute small bowel obstruction have been evaluated.

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TRAUMATIC MYOCARDITIS

A Case of Subepicardial Injury

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IN THIS AGE of violence and acceleration, many injuries to the chest wall occur. Unless specific complaints draw the attention of the examiner at the time of the major accident, special investigations with reference to the cardiac status are very infrequently done. The more obvious orthopedic disabilities usually take precedence in the case of the injured patient.

In the recent medical literature, there have been several reports pointing to the reality of the clinical diagnosis of traumatic myocarditis #2, 3. This paper presents an additional case of this clinical entity — traumatic myocarditis. This term implies that there must be a history of trauma and clinical or laboratory evidence of heart injury.

The history is as follows. Mrs. E. S., age fifty-three, was known to one of us for years. She never had symptoms referable to the heart. In 1951, seven years prior to the present illness, a routine EKG was normal. The present illness dates from 5/6/58. While at work as a bookkeeper, she was caught between two men who were fighting. She was struck on several parts of her body, resulting in bruises to the shoulders, arms, thighs, face, and dislocation of a finger joint. She experienced pains in all the injured areas and went home. A few hours later the pains in the shoulders and chest became very severe. Deep breathing and extension of the neck aggravated the pain in the anterior chest and especially in the substernal region. She was first examined in the accident room of a local hospital. Morphine was given but no examination of the heart was done. The next morning she was seen in the office of one of us. At this time she appeared anxious, pale and in distress. The substernal pain was severe enough to require the use of morphine. An EKG was taken and showed T-wave inversion. Since this finding was not present in the previous record of 1951, it was sus-

pected that injury to the heart muscle had occurred. She was hospitalized for further study and treatment.

On hospital admission, ecchymoses were noted on the arms and left thigh; the right first metacarpal joint was dislocated. She complained of severe substernal pain. Laboratory studies showed a normal temperature; normal blood picture; the transaminase level was 21 units. The EKG was abnormal (Chart 2).

At first a tentative diagnosis of early myocardial infarction was made and dicumarol was started. A few days later, on further study of the abnormal electrocardiograms and because of the finding of a friction rub, the additional diagnosis of contusion of the myocardium with pericarditis was made. At this time the anticoagulant was omitted because of the danger of hemopericardium in the presence of pericarditis.

In a few days the anterior chest pain diminished and only a relatively mild ache was complained of intermittently; accentuated by walking in the room. On discharge on 5/30/58, after twenty-three days of hospitalization, she was almost entirely free from pain when at rest. However, walking resulted in substernal distress. Throughout her hospital stay, the white blood cell counts and transaminase levels remained normal. Also the temperature and pulse rate were normal. However, the EKG showed a sharper and deeper inversion of the T-waves on the second day (Chart 2). Some improvement in the EKG appearance was noted on the following three days (Chart 2) — and a tracing which was only minimally abnormal was recorded on 5/12/58 (Chart 2). The T-waves were found again to be sharply and deeply inverted on 5/16/58 — but no further changes were noted in the following recordings (Chart 3). The pertinent clinical and laboratory findings are summarized in Chart 1.

Following discharge from the hospital, the patient complained of pain substernally on exertion as well as with emotional upsets. The EKG returned to normal three months after the onset. One year later she still had the same symptoms notwithstanding normal findings including exercise tests. It is felt by some observers that the patient had developed a cardiac neurosis at this time.

CHART I

Pulse	Date	Temp:	WBC:	EKG abnorm.	Transaminase:	Pain
90	5/7	N	93	+	21	++
70	5/8	N	...	++	20	...
88	5/9	98.8	96	+	20	...
84	5/10	N	84	+	14	...
102	5/11	98.8	82	+	14	...
76	5/12	N	76	0	20	+
68	5/16	N	58	++	20	+
70	5/20	N	...	++	27	...
76	5/21	N	...	++	20	+
78	5/23	N	...	++	18	...
76	5/24	98.8	18	...
96	5/25	N	...	++	20	?
96	5/26	N	...	++	21	...
72	5/27	N	...	++	38	...
72	5/28	N	...	++	27	...
84	5/29	N	...	++	18	+
80	5/30	98.8	...	++	22	...

The pulse recorded is the highest of the two daily measurements (7:00 A.M., 3:00 P.M.). Temperature (N) denotes normal range.

The temperature was recorded at 7 A.M. and 3 P.M. daily. The value indicated is the highest reading. The symbol N signifies a temperature of 98.6 or less. The EKGs are classified according to the degree of abnormality:

0 = minimally abnormal; + = moderately abnormal; ++ markedly abnormal (see text). The pain is classified according to its severity: 0 = no pain or discomfort

+ = ache or discomfort; ++ = pain.

Description and Discussion of the Electrocardiographic Findings

The tracings of the patient are reproduced in Chart 2.

2/16/1951 (Seven years before the injury): N.S.R. rate 65, PR=0.16 sec., Electrical axis=-+30°, Relative QT=110%, T waves upright in all the leads except AVR. (The relative QT interval, which is a function of the heart rate is expressed in % of the normal values proposed by Lepeshkin. A deviation of plus or minus 15% should be regarded as borderline.⁶

5/7/1958 (Day following the injury): N.S.R. rate 98, PR=0.16 sec., Electrical axis=-30°, Relative QT=130%. Compared to the previous tracing there are several changes:

- 1) Shift in electrical axis of 60 to the left.
- 2) Marked prolongation of the relative QT interval.
- 3) Elevation with upward concavity of the ST segment followed by an inverted T in leads I, II, 11, AVL, V3, V4, V5, V6.

The prolongation of the QT and the ST-T changes are consistent with myocardial injury. The wide distribution of the ST elevation with reciprocal depression in AVR only is consistent with pericarditis.¹⁰ The simultaneous presence

of ST elevation and T inversion is an unusual finding in pericarditis⁶ but it is not inconsistent with such diagnosis.^{6, 10} An additional finding can be noted in this tracing in the differential diagnosis between infarct and pericarditis: the elevation of the ST segment in V4 and V5 does not obliterate the small S wave present previously. According to Lepeshkin⁶ infarction obliterates the S wave while pericarditis does not.

5/8/58: N.S.R. rate 85 PR=0.16 sec., Electrical Axis=0°. Relative QT=135%. Compared to the previous tracing the T waves are now deeply inverted in all the leads except AVR and V1 where they are upright. The wide distribution of the T-wave inversion is consistent with pericarditis.¹⁰ The time of appearance of this deep inversion is somewhat unusual for typical pericarditis in which inversion usually occurs at the end of the 2d or 3d week.⁶ These early findings suggest some other acute damage — widespread and probably subepicardial (see below).

5/9/58: N.S.R. rate 90, PR=0.16 sec., Electrical axis=-15°, relative QT=120%. The tracing has reverted back to the pattern present the day after the injury.

5/10/58 and 5/11/58 do not show any significant change as compared to the one taken on 5/9/58.

5/12/58: N.S.R. rate 85, PR=0.16 sec., Electrical axis=-45°, Relative QT=105%. Reversion toward normal is present in this tracing. Interesting, but probably without special significance, is the further shift to the left of the Electrical Axis.

5/16/58: N.S.R. rate 65, PR=0.16 sec., Electrical axis=-45°, Relative QT=120%. There are marked changes in the T waves which are now deeply inverted in all the leads except AVR and

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CHART 2

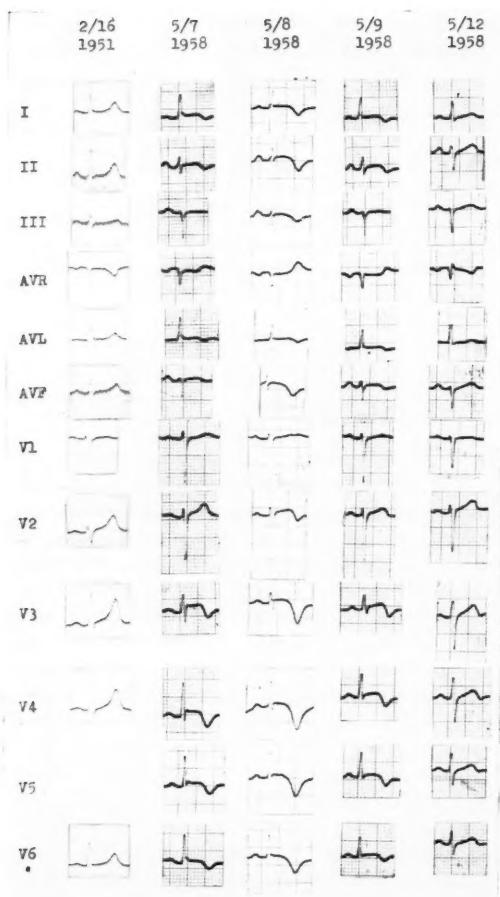
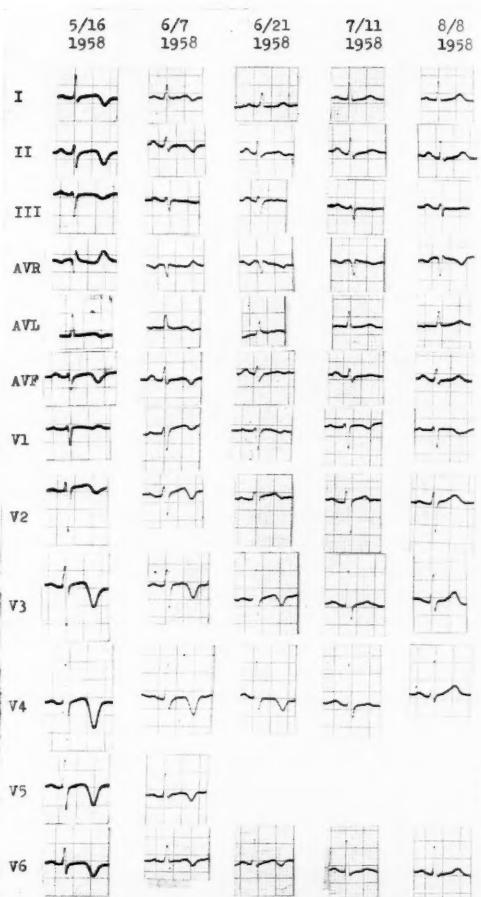


CHART 3



V1 where they are upright. The tracing is now similar to the one taken on 5/8/58, but the T waves are even more deeply inverted. Recurrence of T-wave inversion after they regained normal configuration is not uncommon in pericarditis;⁶ a similar phenomenon is visible in the electrocardiogram of the first of the two cases of myocardial trauma reported by Borodkin and Massey.³

5/20/58 to 5/30/58: the 9 tracings taken during this interval do not show significant changes as compared to those taken on 5/16/58.

6/7/58: N.S.R. rate 70, Electrical axis=+10°, PR=0.16, Relative QT=115%. The T waves are still inverted but less deeply so than before. This appears to be so even if we take into account the fact that the tracing is understanderized.

6/21/58: N.S.R. rate 75, PR=0.16 sec., Electrical axis=0°, Relative QT=115%. The T waves

are now upright in the limb leads except in AVR; where they are still inverted, though less deeply, in the precordial leads.

7/11/58: N.S.R. rate 90, PR=0.16, Electrical axis=0°, Relative QT=110%. The limb leads are essentially unchanged. The precordial leads show upright T waves except in V1. In V2 a terminal inversion of T can still be noted. This does not seem to be an illusion produced by a following U wave.

8/8/58: N.S.R. rate 77, Electrical axis +15°, Relative QT=105%, PR=0.16. The tracing is similar to the previous one except for increase in voltage of the T waves and disappearance of the terminal inversion in V2. The tracing is now normal and essentially identical with the one taken in 1951.

9/2/58, 10/15/58, 11/29/58 are essentially identical with the one taken on 8/8/58. On 11/29/58
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CARCINOMA DEVELOPING IN PSORIATIC LESIONS*

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Carcinoma Developing in Psoriatic Lesions

EPITHELIOMAS ARISING at the site of old patches of psoriasis constitute a rare complication. The tumor may be of basal or squamous cell type.^{1,2,3,4,5} In most of the reported examples, long continued administration of arsenic is believed to be the exciting factor leading to localized areas of malignant degeneration. Since such an incident is unusual, it is felt that a case recently observed is of interest to report.

Case Report

A. H., a white male, age 77, was first seen on January 11, 1960. His history revealed that he had been suffering of psoriasis since the age of fourteen, and through the years, received intermittent external therapy. There is no history of oral medication or physical therapy.

Four years ago, he states that he developed lesions on both lower extremities, at the site of his psoriatic eruption. A biopsy specimen taken from one of the lesions of the legs proved to be basal cell carcinoma. The lesions were electro-desiccated and no recurrence is noted at present.

Two years ago he developed large masses at the site of the psoriatic patches on the scalp, but did not seek treatment for this at that time.

On examination the entire body, including the extremities and scalp, showed erythematous, thick, scaly lesions with excoriations (Figure 1). No lesions were found on palms and soles. The scalp and the left temporal region revealed fungoid, oozy masses ranging from 3 cm. to 5 cm. in diameter (Figure 2). A biopsy specimen taken from each tumor of the scalp was reported as squamous cell carcinoma. All were surgically removed.

Comment

The cause of psoriatic lesions undergoing malignant changes is just as obscure as the cause of

psoriasis itself. Many observers feel that extraneous factors such as therapeutically administrated arsenic and X ray therapy contribute to the development of these changes. Allen⁶ feels that the car-

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FIGURE 1
Showing psoriatic lesions on forearms and hands.



FIGURE 2
Squamous cell carcinoma in old psoriatic patches of the scalp.

*From the Department of Dermatology, Boston University School of Medicine (Herbert Mascon, M.D., Professor).

cinomatous changes in psoriasis are coincidental. This could possibly explain malignancies developing on the normal skin in psoriasis, but does not explain such changes when they occur only in the psoriatic patches.

The carcinogenic vulnerability of psoriasis must await more statistical evidence.

SUMMARY

A case of squamous cell carcinoma developing in psoriatic lesions, without history of oral ingestion of arsenic or X ray therapy, is herewith reported.

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TRAUMATIC MYOCARDITIS

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the relative QT was again 105% and the Electrical axis +15°.

The serial changes noted in these tracings are certainly consistent with myocardial injury. They resemble more closely the changes found in pericarditis than those seen in myocardial infarction in the following points:

- 1) Except for axis shifts and minor QRS changes in the precordial leads, the QRS complex remained the same as it was in 1951. At no time were Q waves seen. If present, they would have pointed to the diagnosis of myocardial infarction. In addition, the R waves show a progressive increase in voltage from V-1 to V-4, which is a sign other than the usual in the development of the anterior myocardial infarction. The minor changes in the precordial leads are easily explained by the different reciprocal position of the exploring electrode and the zero point from day to day.¹¹
- 2) ST elevation and T-wave inversion was present in almost all the leads with reciprocal changes only in AVR. (Depression of ST and upright T).
- 3) Obliteration of the S wave did not occur in V4 and V5 and the other leads where the ST segment was elevated.⁶

No one of these criteria is by itself of absolute value in the differential diagnosis of pericarditis versus myocardial infarction.¹² However the simultaneous presence of these three EKG findings in

our case is strongly suggestive that they were produced by direct mechanical injury involving only the subepicardial muscle layers; and not to a traumatic injury to a coronary artery with consequent infarction. Subepicardial injury and pericarditis should show similar EKG patterns because it has been shown that the abnormal findings of pericarditis occur when involvement of the muscle layer occurs.

It is hoped that physicians will be alerted to the possibility of heart damage at the time of associated injuries to other parts of the body. Careful differential diagnosis between myocardial infarction and subepicardial injury with pericarditis must be made. The almost universal use of anticoagulants presents an element of danger. In the presence of active pericarditis serious or even fatal hemopericardium may result from the use of anticoagulants.

SUMMARY

In summary, a case report has been presented to add to the literature of "traumatic myocarditis." It is felt that the possession of previously normal EKG and normal history, as well as the enumerated clinical and EKG data, places this record in this clinical group. It has been pointed out that the EKG findings are similar to those of the clinical condition of pericarditis. References show abnormal T-wave findings depend on the existence of subepicardial muscle injury. This case satisfies the EKG criteria for the diagnosis of myocardial damage.

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The No. 1 target of medical research is cancer, according to Federal medical research expenditures cited in *Patterns of Disease*, a Parke, Davis & Company publication for the medical profession. This year's appropriations for the National Institutes of Health, through which most of the Federal funds for medical research are channeled, show that \$91,257,000 is being allocated for cancer research. Mental health, with \$68,090,000 allotted, has second priority, followed by research into heart conditions, with \$62,237,000.

EXPERIMENTAL USE OF CARDIOPLEGIC AGENTS IN OPEN-HEART SURGERY*

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ELECTIVE CARDIAC ARREST could be an advantageous adjunct in open-heart surgery. It would provide good exposure with a dry and motionless surgical field, and would reduce the operative time for satisfactory repair of intracardiac pathology.

The original report of Melrose and associates on experimental production of elective cardiac arrest aroused a great deal of interest in this field.¹ Their approach was based on basic observations made by Ringer in 1883,² Hocker in 1929,³ and Wiggers in 1930.⁴ Since then the so-called "potassium arrest" has been utilized with fair success in association with extracorporeal circulation for the correction of some complicated intracardiac defects.

Although substances such as potassium citrate and acetylcholine have been reported as being safe cardioplegic agents,^{5, 6, 7, 8} our results along with those of other investigators do not indicate the reliability of these substances for routine use. The major complications are difficulty in restoring heart beat,¹³ ventricular fibrillation and arrhythmias, resistance to electrical stimulation,¹ myocardial damage,^{9, 10} and prolonged hypotension in the post-operative period.¹⁴

The ideal cardioplegic agent should be able to produce a prompt and effective cardiac arrest that will continue for a period of time sufficient for correction of complicated intracardiac pathology. It should be nontoxic to the myocardium and other tissues and recovery from the arrest should be rapid, safe, and of utmost reliability.¹¹

*Aided by a grant from the Rhode Island Heart Association. From the Cardio-pulmonary Laboratory, Miriam Hospital, Providence, and the Department of Pharmacology, University of Rhode Island, Kingston, Rhode Island.

The purpose of this paper is to present some of our observations with some of the agents which have been used experimentally to produce cardioplegia.

Materials and Methods

Mongrel dogs weighing 8-24 kilograms were anesthetized with 30 mg/kg of pentobarbital sodium administered intravenously. Ventilation was maintained through a large endotracheal tube connected to a mechanical respirator. The chest was opened either through a right thoracotomy incision at the level of the fourth intercostal space or through a midsternotomy incision. Superior and inferior vena cavae were cannulated through the azygos vein and right atrial appendage respectively, and the venous blood was collected by gravity. Oxygenation of the blood was achieved with a mixture of 98% O₂ and 2% CO₂ in a modified Kay-Cross oxygenator. The arterial blood was pumped by a DeBakey pump into a femoral artery. Total body perfusion at a rate of 80-100 cc per kg of body weight was maintained for a period of 10-40 minutes. The temperature of the blood in the oxygenator was maintained at 35-37° C.

Electrocardiograms, arterial blood pH, pO₂, and free hemoglobin were monitored during the procedures. After four to five minutes of total body perfusion and while maintaining a satisfactory blood pressure a non-crushing occlusion clamp was placed across the ascending aorta and cardiac arrest was induced by a slow intra-aortic injection (#22 needle) of the cardioplegic agents mixed with blood (Fig. #1). After varying periods of cardiac arrest (5-25 minutes) the aortic clamp was released, and the coronary arteries were perfused with arterialized blood.

The agents used were: Potassium Citrate; Sodium Citrate; Acetylcholine Bromide; Potassium Chloride; Sodium Phytate, and Methacholine Chloride (Mecholy).

Results

Complete cardiac arrest with sodium citrate was obtained in all animals. (Table 1). The duration of arrest in these experiments varied between five to twenty minutes. The amount of injected drug varied between 25 to 46.1 mg per kilogram body

continued on next page

TABLE I*

Substance	Dose (mg/kg)	Effect Arrest	Duration (Min.)	Recovery	Remarks
Sodium Citrate	41.5	Complete	13	N.S.R.**	Fibrillation Overcome with Calcium
	46.1	Complete	5	None	Fibrillation
	25	Complete	14	N.S.R.	Elec. Defibrillation
	30	Complete	11	None	Fibrillation
	42	Complete	20	N.S.R.
Potassium Citrate	48	Complete	20	N.S.R.
	114	Complete	6	None	Fibrillation
	24	Complete	5	None	Fibrillation
Potassium Chloride	65	Complete	25	N.S.R.	Elec. Defibrillation
	60	Complete	8	None	Fibrillation
Sodium Phytate	48.2	Complete	5	None	Fibrillation
	125	Complete	3	None	Fibrillation
	35.0	Complete	5	None	Fibrillation
Sodium Phytate	19.5	Partial	None	Fibrillation
	15.6	Complete	8	N.S.R.	Elec. Defibrillation
	10.0	Complete	6	None	Fibrillation

*Each result represents work on one dog only.

**N.S.R. = Normal Sinus Rhythm.

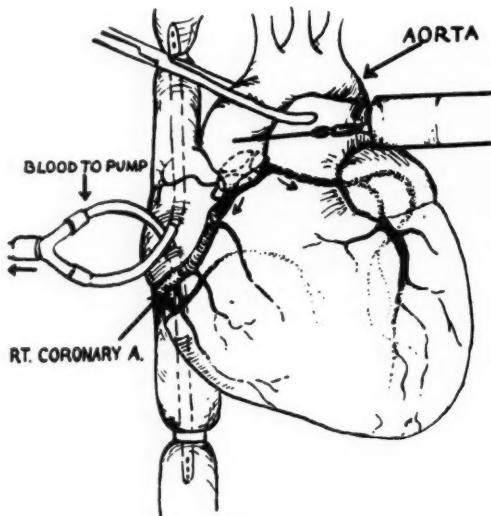


FIGURE 1

Method of producing induced cardiac arrest by the injection of the cardioplegic agent into the root of the clamped aorta.

weight. In one experiment, after twenty minutes of cardiac arrest, normal heart beats were resumed shortly after coronary perfusion with arterialized aortic blood. In four other experiments ventricular fibrillation occurred soon after the release of the aortic clamp. Fibrillation in two instances responded to electric shock.

Cardiac arrest with potassium citrate was complete in every experiment (Table 1.) The required amount varied between 24 to 114 mg/kg body weight, and the duration of the arrest was between

five and twenty-five minutes. In one experiment regular sinus rhythm was obtained after twenty minutes of cardiac arrest. In the other three experiments, ventricular fibrillation followed shortly after coronary perfusion. In one of these experiments regular sinus rhythm was established by electric shock, and in the others ventricular fibrillation was persistent and did not respond to counter shock.

Complete cardiac arrest (three to eight minutes) was produced in four experiments with injections of potassium chloride varying from 35 to 125 mg/kg body weight. The recovery period in every instance after coronary perfusion with arterialized blood was short and followed by ventricular fibrillation not responding to electric stimuli and cardiac massage.

Complete cardiac arrest was obtained in two dogs with the injection of 10.0 and 15.6 mg/kg body weight of sodium phytate respectively (Table 1). In both experiments ventricular fibrillation followed shortly after the release of the aortic clamp and coronary perfusion, in one case responding to electric shock and cardiac massage. In another experiment complete arrest could not be obtained and shortly after injection of 19.5 mg/kg of sodium phytate persistent ventricular fibrillation occurred which did not respond to electric shock.

Cardiac arrest with acetylcholine was carried out in four experiments. Although during the arrest the myocardium appeared to be flabby, it responded to the stimulus and ventricular handling. The arrest in three experiments appeared to be complete with the injection of 6.1, 7.3, and 9.7 mg/kg body weight of acetylcholine respectively. Normal beats

resumed in one dog after seven minutes of cardiac arrest. In the other two, ventricular fibrillation followed shortly after seven to ten minutes of cardiac arrest and coronary perfusion with arterialized blood. Light electric shock converted one of these to a normal rhythm and in the other, the heart beat could not be restored to normal. Complete arrest could not be obtained after injection of 7.8 mg/kg body weight of acetylcholine in one dog. The ventricles fibrillated and did not respond to counter shock.

Methacholine chloride was used in three experiments. The duration of arrest produced by 1.5 mg/kg was short in two experiments and spontaneous heart beats were resumed after one minute of arrest while the aortic clamp was still in place. In the third experiment cardiac arrest could not be produced even after a dose of 27 mg/kg was injected. Soon after the release of the aortic clamp, parasympathomimetic reactions with severe hypotension were observed in every case.

Discussion

One finds in the literature no uniformity of opinion regarding the clinical use of cardioplegic agents in open-heart surgery. Opinion varies from total skepticism to advocacy of routine employment during open-heart surgery.

Our results indicate that the heart can be arrested with various cardioplegic agents besides potassium citrate and acetylcholine. In our experiments, complete cardiac arrest was obtained with sodium citrate, sodium phytate, methacholine, and potassium chloride. There appeared to be no predictable relationship between the dosage of the drugs used and the production of cardiac arrest. Only a minimum amount of drug was necessary in some of our experiments, while in others considerably more was required. Yet recovery was satisfactory after even twenty to twenty-five minutes of cardiac arrest (potassium citrate, Table 1).

The recovery rate after production of cardiac arrest followed by perfusion of coronary arteries was not predictable. Ventricular fibrillation and incompetent myocardium were the major problems. Ventricular fibrillation was converted to regular sinus rhythm with a light electric shock in some cases. In others, however, the fibrillation was irreversible and did not respond to any stimuli or cardiac massage. The duration of arrest seemed to have no relationship either to the rate of recovery or the dosage of the drug injected. In some experiments, the heart beat did not resume after as little as one minute of cardiac arrest. Yet under exactly similar conditions a normal heart beat in other instances returned after twenty minutes of cardiac standstill.

Our results are in agreement with those of Kaplan et al,¹² in that washing out of the cardioplegic agents from the circulation by aspiration of the blood from the right auricle does not appear to change the pattern of recovery. In our last fifteen experiments the blood was aspirated from the auricle shortly after production of cardiac arrest. The rate of recovery in these experiments was about the same as for those of our earlier experiments.

With the use of methacholine chloride the parasympathomimetic and hypotensive reactions were seen in every instance shortly after release of the aortic clamp. These reactions coupled with the short period of cardiac arrest make the drug totally unsafe and impractical for clinical use.

The cause of cardiac arrest is a matter for discussion. Almost all of the cardioplegic agents which have been used, with the exception of the cholinergic drugs and potassium chloride, have the ability to bind ionized calcium. We feel that arrest with these agents is due to the binding of ionized calcium thus upsetting the calcium-potassium ratio. As further evidence supporting this hypothesis, cardiac arrest has been produced experimentally by continuous perfusion of the heart with hypocalcemic blood (Clark).¹⁵ Investigations are presently under way to determine the amount of ionized calcium which is bound in the myocardium by the cardioplegic agents.

SUMMARY AND CONCLUSIONS

In thirty dogs subjected to cardio-pulmonary bypass, cardiac arrest was achieved by means of various cardioplegic agents. The following observations were made:

1. Cardiac arrest was easily induced with several cardioplegic agents in addition to potassium citrate and acetylcholine, previously reported. These are sodium citrate, sodium phytate, methacholine, and potassium chloride.
2. The binding of ionized calcium as well as the increase of potassium ion concentration produced cardiac arrest.
3. The rate of recovery after cardiac arrest and perfusion of the coronary arteries with arterialized blood was not predictable.
4. There was no relationship between the amount of cardioplegic agent injected and the duration of cardiac arrest or the rate of recovery.
5. None of the cardioplegic agents tested appeared safe for routine clinical use, under the conditions of these experiments.

Acknowledgment

The technical assistance of MISS LILLIAN DEL-
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CINEANGIOCARDIOGRAPHY IN THE STUDY OF CONGENITAL HEART DISEASE*

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ADVANCES IN cardiovascular surgery have led to the successful correction of a growing number and variety of congenital cardiac lesions. Effective treatment depends upon accurate identification of the cardiac defect and evaluation of the hemodynamic alterations resulting from the abnormality. Cardiac catheterization data correlated with the clinical study of the patient will provide this information in most cases. Morphological demonstration of the cardiac lesion or abnormal great vessels, however, requires the use of contrast roentgenographic techniques.

The first X-ray studies of the cardiac chambers were made in 1931 by Moniz, DeCarvalho and Lima.¹ Their method was further refined and popularized in the United States by Robb and Steinberg² in 1938. Since then a number of modifications and improvements in the technique of angiography have occurred.

Contrast media of greater density and less tissue toxicity have been developed.³ Selective injection of opaque media through accurately positioned intracardiac catheters as described by Chavez⁴ has resulted in better diagnostic films by eliminating the problem of overlapping opacified chambers. To overcome resistance to flow of viscous iodinated compounds in long catheter systems, high pressure injection devices have been used.^{5, 6} Expensive rapid film changers for use with conventional X-ray machines utilizing roll or cut film have evolved. The maximum speed of the more popular model* generally used is six films per second. A device recently designed in Sweden has a maximum capacity of 12 exposures per second.** While the study of single frame angiograms ob-

tained with the techniques and equipment described above has provided much useful information, the full potential of this diagnostic method has been limited by the relatively slow speeds of the film changers. Fleeting pathological events occurring in the rapidly beating hearts of children have been frequently missed.

Although it was recognized for a long time that a motion picture photographic technique was ideal for recording rapid motion, the method when utilized with conventional fluoroscopy was limited because of the excess radiation hazard to the patient. The development of X-ray image intensification with a field size large enough to include the entire adult cardiac shadow made possible the routine clinical use of cinematography for recording the moving fluoroscopic image. By this method a fluoroscopic image is intensified 750 to 1,000 times in brightness by electronic means. It is beyond the scope of this paper to review the physical principles of X-ray image intensification and the interested reader is referred to the excellent reviews by Hedges and Skaggs⁷ and by Morgan and Roach.⁸ It is our purpose to describe a technique of angiography utilizing high speed cineradiography and to discuss our experience with this method in the diagnosis of congenital heart disease. We have employed the method in fifty-three patients since January 1, 1960. There has been no morbidity or mortality.

Description of Apparatus

The apparatus (Fig. 1)† consists of a fixed horizontal X-ray table under which is mounted a 200 MA rotating anode tube with a fixed focal spot to table top distance of 30 inches. An eight-inch image amplifier tube is mounted on a fluoroscopic carriage attached to the table. The X-ray image is intensified more than 750 times greater than that available with a conventional fluoroscope. A television pickup and a 16 mm. cineradiographic camera are mounted in a common head, focused upon the

*Manufactured by Georg Schönander Co., Stockholm, Sweden.

**Manufactured by Elema-Järnh, Stockholm, Sweden.

†The Picker Cardiological X-ray Unit, Manufactured by The Picker X-Ray Corporation, 25 South Broadway, White Plains, N. Y.

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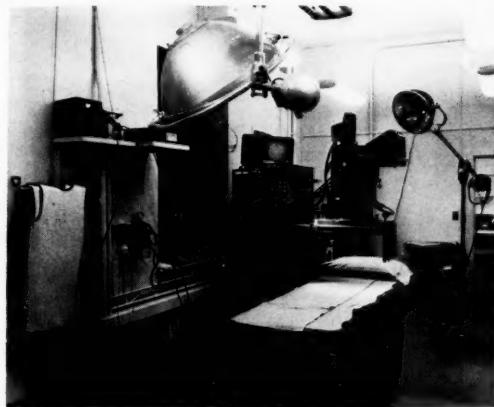


Figure 1. Cardiological X-ray apparatus with television and electronic monitoring devices in the cardiac catheterization laboratory.

output phosphor of the image amplifier tube. Either can be brought into play at will. A mirror optical system also permits direct viewing of the image. The signal from the television pickup is transmitted to a 17-inch conventional receiver for use during cardiac catheterization. This same image is transmitted through a closed circuit to an adjacent room for teaching purposes. The cineradiographic camera is accurately synchronized with the X-ray tube which is energized only when the camera shutter is open. In this way radiation exposure to the patient is reduced by one-half. Film speeds of $7\frac{1}{2}$, 15, 30 or 60 frames per second can be selected. In angiography, an exposure rate of 60 frames per second is routinely employed.

Exposed film is developed rapidly in an automatic processing unit at the rate of three feet per minute. An angiogram obtained in this way is available for diagnostic viewing within 30 minutes.

A modified version of the Kodak Analyst Projector* is utilized for film viewing through a wide range of speeds. The film can be reversed at will or stopped for single frame study.

Technique

General anesthesia is not employed. Patients are sedated one hour before the study with phenegran, meperidine and scopolamine. Under local anesthesia, the left median basilic vein is exposed through a one centimeter skin incision. In smaller children, the saphenous vein is isolated in the groin. The vein is then cannulated with a cardiac catheter of suitable size. The choice of the catheter is important. Early in our experience, we employed special Lehman catheters whose inside diameters were

*Weinberg-Watson Projector Modification.

larger than those of Cournand catheters customarily employed for routine cardiac catheterization. A significant disadvantage of this type of catheter was that it had an end opening. The jet-effect of the injection frequently caused the catheter to "whip" or recoil out of the chamber being studied. We now use a catheter developed by Rodriguez-Alvarez⁵ with a closed end and six laterally directed openings. Recoil has not been observed with this catheter. A catheter size less than a No. 7 French is never employed since the resistance to flow by smaller inside diameters precludes the delivery of an adequate bolus of dye. The catheter is threaded through the vein into the heart and guided through the right heart chambers and pulmonary artery with the aid of television monitoring of the fluoroscopic image. Appropriate pressures are recorded and blood samples are drawn for the determination of oxygen saturations. The catheter is then positioned accurately in the region to be studied by angiography and a bolus of radiopaque medium injected. For the study of most congenital cardiac lesions an injection into the right ventricle is preferred.

The contrast medium of choice in our laboratory is ninety per cent sodium diatrizoate (Hypaque M).⁹ This preparation has radiographic qualities superior to other media³ and has exhibited less tissue toxicity in the laboratory. At room temperature this medium separates into crystalline and fluid fractions and requires heating to body temperature before it can be used. This is accomplished in a syringe heater of our own design.¹⁰

We have employed a lever injector described by Lehman¹¹ which in our experience has proved adequate. The pressures developed by this device are comparable to the Gidlund power injector⁶ set at 6 kg. per square cm. Beyond this pressure many catheters rupture. For this reason we have avoided the more elaborate high pressure devices. The amount of opaque media for any given injection is calculated upon basis of the patient's weight, heart size and rate. This usually amounts to one cc. per kilo of body weight per injection. When necessary, several injections of fractionated amounts of opaque medium are employed. However, the total dosage administered in any given study usually does not exceed two ccs. per kilogram of body weight. The injection of the radiopaque medium is continuously monitored by the radiologist during the motion picture filming by means of a light-splitting mirror.

Following the completion of the study, the catheter is withdrawn and the vein ligated. The skin incision is closed with a suture of fine silk and an adhesive bandage is applied.

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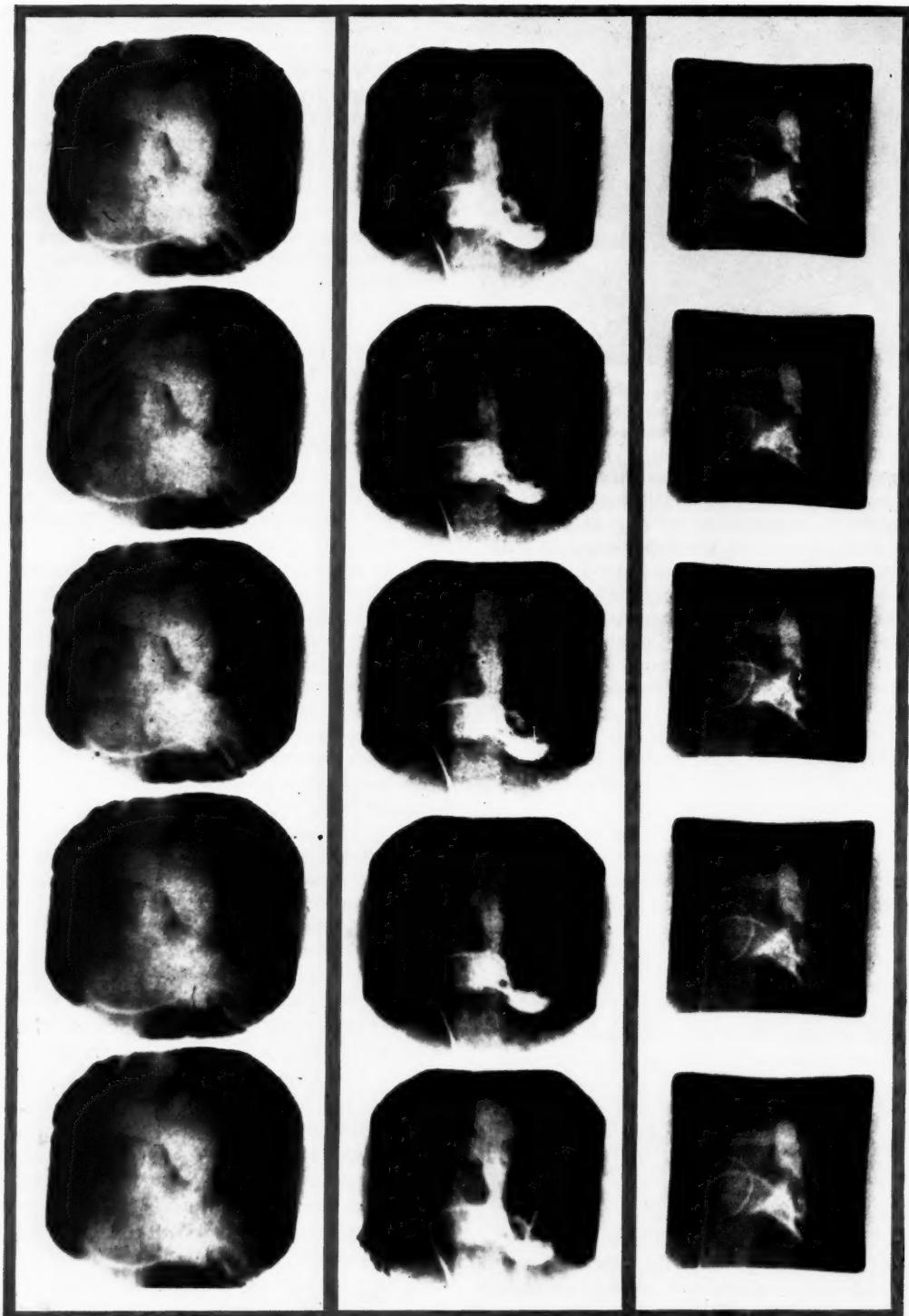


Figure 2. Motion picture film strip showing a right to left shunt in Tetralogy of Fallot.

Figure 3. Film strip demonstrating the jet observed in pulmonary valvular stenosis.

Figure 4. Severe infundibular stenosis of the right ventricle.

CINEANGIOCARDIOGRAPHY IN THE STUDY OF CONGENITAL HEART DISEASE*concluded from page 573***Discussion**

High speed cinematography combined with fluoroscopic image intensification is a method which makes possible the study of cardiac dynamics as well as morphology. Events occurring during the injection of opaque media which before were recorded only fortuitously by serial radiographs can now be routinely observed when filmed at the rate of 60 exposures per second. This is of particular importance in the diagnosis of congenital heart disease where the infant heart may be beating at a rate of 180 strokes per minute. The ability to project the recorded film at various speeds for study makes possible the appreciation of valve motion, the direction of shunts, atrial and ventricular changes during the cardiac cycle, and alterations in the great vessels.

Cyanotic anomalies of the heart resulting from right to left shunts can be diagnosed with a high degree of accuracy when right heart injections of opaque media are employed (Figure 2). With left to right shunts, atrial and ventricular septal defects can be readily identified either by negative jets (areas of blanching) of non-opacified left heart blood during the early phases of injection and by reopacification later during the left heart filling phase. We have also been impressed with the frequency with which ventricular septal defects with predominantly left to right shunts are transiently reversed during the injection phase permitting an accurate diagnosis. In patent ductus arteriosus a blanching defect in the pulmonary artery and late reopacification of this vessel are clearly seen.

Abnormalities of the pulmonary valve and the pulmonary outflow tract of the right ventricle are consistently demonstrated (Figures 3 & 4). Moreover, it is possible to study these anomalies in motion. Thus in pure pulmonary valvular stenosis, the width and direction of a jet of opaque medium into the dilated pulmonary artery provides the surgeon with an estimate of the valve orifice size and its relative position in the valve complex. Similarly, subvalvular muscular hypertrophy which if studied in a single frame during systole might be considered significant is frequently found to dilate adequately when studied in motion during diastole.

In general, the abnormalities discovered by cineangiography correlate well with data obtained by cardiac catheterization. In some instances the findings obtained with cineangiography have served to elucidate perplexing catheterization data. This method, however, furnishes data concerning the site, shape, and extent of the lesion essential in planning the surgical procedure which

cannot be obtained in any other way.

The image obtained on motion picture film (16 or 35 mm) can never be as sharply resolved or detailed as one recorded by the still radiograph. When a single frame of a motion picture film is studied, increased graininess may be disturbing. However, with motion, the eye of the observer integrates the image on several succeeding frames so that a greater amount of detail is visible than on any single frame. This feature together with an appreciation of the dynamics of cardiac action increases the diagnostic accuracy of the method.

SUMMARY

Cineangiography is now possible as the result of improvements in fluoroscopic image intensification of sufficient field size to include the adult cardiac shadow. It affords an accurate method of studying the anatomy and dynamics of heart action essential in planning effective heart surgery. The technique for performing selective cineangiography at the Rhode Island Hospital is described in detail. This method has been employed in fifty-three patients without morbidity or mortality.

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Wednesday, October 26. Council of New England Medical Societies, Statler Hotel, Boston (afternoon).

SOCIETY STATES POSITION TO DEMOCRATIC PLATFORM COMMITTEE

(Statement of **EARL J. MARA, M.D.**, *President of the Rhode Island Medical Society, at the Advance Platform Hearing of the 1960 Democratic National Platform and Resolutions Committee, at Providence, Rhode Island, June 30, 1960*)

THE Rhode Island Medical Society is fully aware of the tremendous political implications of a federally subsidized health care program for citizens over the age of sixty-five years. As citizens, the doctors of Rhode Island are equally concerned with all residents of our community with the ever increasing tax burden that is placed upon everyone while there is little or no effort made by our national and state governments to halt inflation of the dollar which deprives the wage earner, or the retired worker, adequate funds to meet the ever rising costs of living.

The medical profession maintains that personal medical care is primarily the responsibility of the individual. When he is unable to provide this care for himself, the responsibility should properly pass to his family, the community, the state, and only when all these fail, the federal government, and then only in conjunction with the other levels of government, in the same order.

We call to the attention of this Committee that Rhode Islanders have an outstanding record in resolving their hospital and medical care needs. The program of the Division of Public Assistance in the State Department of Welfare has developed, with the aid of the medical profession, one of the truly outstanding medical care plans among the states of the country. The liberal provisions of that program are well documented in the reports readily available to this Democratic legislative committee.

We also submit for your consideration the recent report compiled through the Research Department of the Blue Cross and Physicians Service of Rhode Island which shows that better than 93% of the self-supporting (those not institutionalized nor receiving medical care through public assistance) persons over the age of sixty-five years have Blue Cross coverage, and nearly 77% of persons over sixty-five have Physicians Service coverage.

We also call to your attention that under the Physicians Service program the participating doctors accept the payments from the insurance as the complete fee for the surgical and anesthetic service rendered for all persons with less than a \$6,000 income.

These facts bear out clearly that the older age persons in Rhode Island recognize the advantage of the voluntary insurance programs, and have willingly subscribed to them. The co-operation of the doctors of this state in making this program one of the most liberal in the nation is further evidence that the problem, if such it is or ever becomes in this state, can be resolved at the local level with our own community resources.

We submit that the determination of medical need should be made by physicians, and the determination of eligibility for assistance through public funds should be made at the local level with local administration and control. The principle of freedom of choice of physician should be preserved at all times.

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GERIATRICS — A MAJOR PHASE OF MODERN MEDICINE

ONE HAS BUT TO walk through the medical wards of a general hospital today to realize that geriatrics is no longer a narrow field in which a few physicians may find an interest, but rather that it constitutes a very large part of the practice of the family physician and the internist. In such a ward the age of the average patient is often found to be between sixty-five and seventy-five years. Had these individuals been born fifty years earlier many of them would have succumbed to lobar pneumonia, typhoid fever and other infections. Modern sanitation, prophylaxis, and treatment have allowed them to survive, and today we find them suffering from conditions many of which are dependent upon cardiovascular, renal, and pulmonary damage which, as knowledge increases, will be found to be to an extent preventable. As Doctor Basylewycz¹ has pointed out in his classical studies of the aged, the normal life span of a human being may well be 110 to 120 years, and a large portion of the factors which now preclude its attainment are probably preventable.

Geriatrics, then, is no longer to be considered a specialty, but rather it is a phase of general medicine which now must occupy a major part of the interest of the medical profession. Studies in this field, however, have occupied the particular attention of certain groups. Of these, the results of the recent meeting of the American Geriatric Society, held on June 9 and 10 of this year, and released to the lay press in the form of summaries are of considerable interest.

Atherosclerosis and its relation to a diet high in animal fats, a subject of the greatest interest and on which there appears to be a great deal of conflicting opinion, was discussed by Doctor Laurance Kinsell who stated that "increasing evidence points to a sufficiently close relationship to warrant specific recommendations on the composition of the average American diet." The substitution of the polyunsaturated fats of vegetable origin (not simply the addition of such substances) has been shown to lower blood cholesterol and other fatty

materials in the plasma, and a diet so modified should be an effective factor in the prevention of such conditions as strokes, coronary heart disease and the even more grim occurrence of chronic cerebral deterioration and resultant senility."

Other presentations, including discussions of the treatment of various cardiovascular conditions and the socio-economic status of the elderly, were also of interest. The assets of the aged were stressed by several speakers. The use of tranquilizers and of diuretics were the subjects of two papers and in another the conservative treatment of hypertension in these patients was discussed.

The program of the meeting did not include anything on the subject of chronic pulmonary disease, a condition by which a large number of our elderly citizens are incapacitated. This is a broad field including chronic bronchiectasis and asthma, but the most prevalent condition, especially in elderly men, appears to be chronic obstructive emphysema. Pulmonary cripples from this latter condition have to be admitted to the hospital whenever slight intercurrent respiratory infection further compromises their respiration. This condition, according to the available evidence, results from chronic irritation of the bronchioles by long exposure to various agents by far the most important of which is inhaled tobacco smoke.

The importance of all these conditions, cardiovascular, cerebral and pulmonary, particularly in elderly individuals, needs no further emphasis. Their prevention, which should begin early in life, will depend upon effective health education. A large part of the future work of the profession will be to attempt by precept and example to carry out such education and thus to accomplish two main objectives, the increasing of the length of life and, more important, the avoidance of crippling invalidism which leaves the patient alive, but so damaged that life is not worth living. Thus there will be preserved for our elderly citizens an increased opportunity for an effective life and the continued pursuit of happiness.

¹Rhode Island Medical Journal, December, 1951, page 641

continued on next page

WHAT IS PARTICIPATION?

A STUDY earlier this year by the administrative staff of Rhode Island Medical Society Physicians Service revealed the rather surprising fact that only 277, or considerably less than one third of the total of 917 participating physicians as of that time, provided all of the service rendered by physicians on a "service" basis during the preceding year. The total membership of the Society was 961. In other words the important responsibility and obligation of making possible this attractive feature of Physicians Service devolves upon some 29% of the physicians of Rhode Island.

Service rendered on a service basis may in essence be defined as surgery and anaesthesia performed on under-income patients by participating physicians. Participating physicians are those who have signed a contract to provide such service benefits. Because of the nonsurgical nature of their practice, and because medical in-hospital care, obstetrics, and X ray are not provided to anyone on a "service" basis (the doctor may charge a fee not predicated upon income limit) nonsurgical specialists and general practitioners are not in general called upon to provide service benefits, even if they are contractually "participating" physicians. The practical effect of this situation is that the 71% of physicians constituting the latter groups control internal policy in physicians service, and in particular policy affecting service benefits which they do not provide.

To conform to the requirements of the recently instituted Federal Employees Health Benefit Plan, adjustments were made in the income limits of both the A and B plans. The required increases in income limits were made without countervailing increases in the fee schedules. The income limits in the A plan were raised in the various categories from \$400 to as much as \$1000. These generous changes were made in a plan that had already been in operation for many years with satisfactory acceptance by the public. The B plan indemnity schedule, predicated on a \$5000 income limit and

adopted after many months of painstaking and laborious negotiation, was activated on the basis of a \$5500 limit but without adjusting the benefits to take into account the higher income limits. This generous compromise was accepted in response to an earnest and eloquent plea by industrial representatives.

The most recent increase in income limits of the B plan to conform to Federal Requirements (again without countervailing alterations in the fee schedule) involves total increases in income limits from those originally negotiated of \$700 to \$1800! It should be pointed out that these new advantageous and generous provisions granted to Federal employees have become generally available to all subscribers without increase in cost, again made possible through the participation of those physicians constituting less than one third of the profession, who provide service benefits.

Often in explanations of income limits in the press, it is stated somewhat erroneously that for patients under these income limits physicians *have to* accept the amount provided in the fee schedule. It should be pointed out that participation by physicians is voluntary, and no one *has to* provide service benefits.

There is a further common misconception that participating surgeons and physicians are *required* to provide service benefits for everyone. The contract provides that patients occupying private rooms, those over the income limits, and those having additional forms of medical payment insurance are not entitled to service on a participating physician service basis.

A legitimate fear now expressed by many physicians in Rhode Island is that freedom of action will be seriously abridged with the entrance of the Federal government into our local plans. Participation or nonparticipation notwithstanding, the fee the physician charges will be dictated by government. This is a serious and foreboding change in the philosophy of medical practice.

CADILLACS AND CARDIACS

In a nation in which daily living has become too soft and easy and where the control of infections has stretched the average life expectancy to the biblical fourscore years and ten, there are, perhaps fortunately, factors that still can and do cut down those who will not make the effort to keep fit. The rather over-nourished business or professional man who regularly uses his automobile to travel three or four blocks, has almost forgotten how to walk

because to use his car is quicker and easier. As the car is one of the large showy affairs, Cadillac or something of similar grade, it gives him "status" whatever that means. He puffs a little on going upstairs perhaps, and, instead of keeping at it and acquiring the normal exercise tolerance that nature intended he should have, he concludes that at his age it's "bad for his heart." We may even see his doctor doing the same thing. He ought to know better!

It is certainly not intended to imply a criticism of Cadillacs or other fine automobiles, but, like good liquor, they are often misused.

It is natural that those who have had heart attacks of one sort or another should be fearful lest physical overdoing bring on recurrences. They will do well, however, to find out by careful trial under medical supervision what their limits of tolerance are. Having done so, they should keep themselves and their hearts in optimum condition by regular exercise within those limits. The man who thoughtlessly fights snowdrifts in the winter and precipitates an attack (which no doubt would soon have come on anyway) is not using reasonable judgment, but the same is true of him who persists in taking the elevator to go up one flight and will not walk a few blocks or up a hill.

Emergencies are bound to arise and when they do he will be found wanting.

A VERY SPECIAL GIFT

Each fall millions of Americans respond generously to the call of their United Fund, Community Chest, Good Neighbor Fund, or similarly named United way campaign. Last year they gave a combined total of 455 million dollars to support 28,000 voluntary health and welfare agencies serving 81.3 million men, women and children.

Those are impressive figures. They verify our belief that Americans are truly warmhearted. We feel particularly strongly about this right now because we've been listening to cynics who tell us how remote we are from each other, how little we care about our fellow man.

Researchers have dug up cold-blooded facts that charge us with giving from habit, from social pressure, from desire for community status, guilt feelings, or for "insurance" against the time we ourselves need help. That may be true of some of us, but we're sure there's more to it than that.

The habit of kindness does not die easily. We've had it instilled in us too long. It's deeply rooted in our heritage.

Personally, we should give because the warmth and satisfaction of giving is unmatched by any other feeling we know.

A MAN TO REMEMBER

When I was *Gyn intern* at the Rhode Island hospital during the winter, 1922-1923, Doctor Herman Pitts told me he wanted me to help him with some sixty private cases during the month of January because he wanted to attend the International College of Surgeons congress in South America during the month of February. As a matter of fact he did sixty-six cases and most of them were hysterectomies. Four hysterectomies each morning was

routine procedure, beginning at 8:00 A.M. and ending at 12:00 NOON — and all done in the same room.

When the noon whistles were blowing over the city of Providence, Doctor Pitts would be taking off his rubber gloves after finishing his fourth case, and he would be "fresh as a daisy." He had no acquaintanceship with physical or nervous exhaustion. His cases never seemed to go into shock because his operating time was always at a minimum. Doctor Pitts was ambidextrous with the scalpel, scissors, clamps and knots. No wasted motion nor idle chatter for him — he was always moving ahead.

On another occasion while I was scrubbing to assist a doctor with a hysterectomy operation Doctor Pitts wanted to know how soon I could help him with a ruptured ectopic that he had just sent into the hospital. I told him it would be at least an hour. He said he had a hysterectomy scheduled at the Jane Brown hospital and he would try to operate at once and come back later. About one hour later as we were just completing our operation, Doctor Pitts reappeared, having completed his operation, and he was back in civilian clothes. What a man! A master surgeon! A Man to Remember.

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THE MANAGEMENT OF MULTIPLE INJURIES*

CYRIL J. BELLAVANCE, M.D., AND JOHN G. PIERIK, M.D.

The Authors. Cyril J. Bellavance, M.D., Assistant Surgeon, Department of Orthopedics, Rhode Island Hospital, Providence. John G. Pierik, M.D., former Resident, Department of Orthopedics, Rhode Island Hospital, Providence. Currently, Captain, Medical Corps, U.S.A.F., at Lockbourne Air Force Base, Ohio.

THE CORRECT CARE and management of the severely traumatized patient has progressively become a subject of considerable discussion, increasing importance and widespread educational interest. This is reflected on a national scale by the organization of various courses in trauma, scientific investigation,¹ creation of local and national trauma committees and increasing literature devoted to this subject.

The reasons for this are multiple. The population of today has more leisure time available for recreation and travel, both increasing the exposure to injury. Automotive vehicles are much more numerous and of such size and power to produce more accidents of far greater severity. Then too, we have passed into an era of rapid and efficient ambulance service, available blood banks, scientific fluid and electrolyte replacement, antibiotic control of secondary infections and practical and efficient methods of internal fixation of fractured bones. All of these factors have greatly increased the chances of survival and a more satisfactory recovery of the acutely injured patient.

Everyone concerned with the early care of the injured should have a basic foundation in the proper management and handling of this type of patient. This should include not only the orthopedists, but general surgeons, neurosurgeons, urologists, pediatricians, general practitioners and medical consultants. "Trauma cuts across all branches of medicine with a superb disdain for the man-made boundaries of the different specialties."²

It is not the purpose of this paper to describe any particular method or surgical technique, but merely to outline what we believe to be a correct, over-all early management and continued care of the severely injured.

I. Principles

A. Adequate patient ventilation

should be of

*From the Department of Fractures, Rhode Island Hospital, Providence, Rhode Island.

paramount importance. It is not enough to consider the patency of the respiratory passages, but also to evaluate the status of the lungs and musculoskeletal cage. This can be quickly and efficiently determined by direct inspection of the chest wall, noting its excursions and symmetry. Gentle palpation will easily discover subcutaneous emphysema and help to localize fracture sites about the rib cage. We have found vocal fremitus to be a very quick and accurate diagnostic sign in the search for an early pneumo- or hemothorax. The examining physician should not forget the humble stethoscope in order to listen for the presence of equal breath sounds, the snap of broken ribs, and the diagnostic crackle of subcutaneous emphysema before it becomes palpable.

B. *Control of hemorrhage* can nearly always be accomplished quickly by pressure dressings. Only rarely is there a necessity to use a hemostatic snap on a particularly brisk arterial bleeder. All tourniquets should be promptly removed because of their possible effect of producing ischemic changes, neurovascular injury or excessive bleeding by hindering venous return only.

C. *Evaluation of shock* can be quickly performed by feeling the skin of the forehead and chest. The presence of cool, moist skin will quickly confirm the presence of shock or impending circulatory collapse. Blood pressure, and particularly the pulse (and its quality), should be recorded frequently, preferably by one person. Typing and cross-matching must be done promptly to obtain whole blood as needed.

Intravenous saline should be started with the same venipuncture. Plasma or plasma expanders can be started immediately while waiting for the whole blood to arrive. *Under no circumstances should the patient be moved or treated extensively until the circulatory status is fully restored.* Hemoglobin determinations are only misleading and time consuming.

D. *Open wounds* should be cleansed with saline or aqueous zepharin and covered with sterile pressure dressing until definitive treatment may safely be given. We strongly believe that all open fractures and dislocations should be cleansed, debrided and closed in the operating room. However, if it becomes apparent that considerable time will elapse

before this can be done (4 to 6 hours), we have treated these wounds in the emergency ward. Thorough prepping, irrigations with normal saline, and debridement should be done carefully by a masked and gloved surgeon. One-half per cent novocain may be used safely for local infiltration anesthesia. To date we have not regretted doing this when indicated.

E. Complete and accurate evaluation of intracranial, visceral or spinal cord injury must be made. We have found that complete undressing of the patient will expedite the examination and make it more thorough. One should never hesitate to cut off clothing if need be. A severely injured patient must be kept warm, and this is well done with the use of blankets. We have employed abdominal paracentesis, without adverse effects, to determine the presence of intra-abdominal bleeding when indicated. An indwelling catheter should be inserted to determine urethral patency, bladder integrity or urinary tract bleeding. Appropriate consultations should be obtained promptly whenever indicated.

F. Fractures with displacement or angulation should be grossly aligned and firmly splinted until definitive reduction and immobilization can be carried out.

Suspected fractures must also be adequately splinted to prevent further damage. Dislocations should be reduced as promptly as possible. We have observed the prompt emergence from shock when a major dislocation, such as the hip, is reduced.

G. Control of pain and restlessness, possibly producing further injury, can be safely accomplished by giving small doses of analgesics. We prefer Demerol or morphine in small intravenous doses as needed. We hesitate to use barbiturates or the chlorpromazine derivatives because of the central depressant features of the former and the occasional severe hypotensive reaction of the latter especially after acute blood loss has occurred.

H. Prevention of further injury especially to the spinal cord and soft tissues, must be attempted by avoiding needless sitting, turning or standing of the patient until proper splinting, examination, and diagnostic X rays can be safely done. It is best to keep the patient supine on a firm surface with the head sandbagged in a neutral position if any question of spinal injury exists.

I. Rapid and direct transportation to the operating room or unit must be available and attempted only when the patient's condition is stable. It is frequently wise to notify the unit of the patient's incipient arrival so that adequate help, and any necessary equipment may be on hand. Sometimes

it may be much wiser to proceed directly to the operating room.

J. Diagnostic X-ray studies should only be attempted when the patient is out of shock and stable. It is not always a medical necessity to X ray an obvious fracture or dislocation if in so doing it could jeopardize the patient's condition. However, there are medico-legal implications involved in this situation, and when it is best not to X ray, one should be sure of the indications and should have this clearly recorded on the medical record.

K. Teamwork is frequently the key to success. This is of vital interest between the physician and the auxiliary personnel. One doctor should assume complete charge and direct others to specific tasks. The patient should be admitted, without hesitation, to the most appropriate service, surgical, fracture or neurosurgical, as the most serious aspects of the injury dictate. Close and willing co-operation must be present between consulting services.

L. Miscellaneous adjuvants necessary for successful treatment must be available. These include; nasal oxygen, suction catheters, tracheotomy set-up, intravenous materials, venous cut-down equipment, compressive wraps, pillow splints and Thomas splints. Frequently one or two small, easily overlooked items may spell the difference between success or failure.

II. Case Presentation

The following case history is presented as an example of what we feel to be the proper early and continued management of an acutely and severely injured patient. This case represents as severely traumatized an individual as we have seen in several years. It can well compare with the "record" case described by Watson-Jones.³

R. A., Rhode Island Hospital #587344

This twenty-year-old white male was brought to the accident room at 11:55 P.M. on 12/20/57. He was ejected about twenty feet from an automobile which had collided with a tree. (Figure 1)

On admission he was barely responsive. The blood pressure was not obtainable. The pulse was 140, faint and thready. Precursory examination revealed an open fracture of the left lower leg (Figure 2). An 8-inch, vertical laceration exposing the right tibia was present on the right lower leg. A 4-inch laceration was present extending deeply into the perineum.

The right leg was held in adduction and external rotation, the right femoral head being palpable in the groin, diagnostic of an interior dislocation of the hip (Figure 3). An obvious fracture of the left mid-humerus (Figure 4) was present. A 3-inch

continued on next page



Figure 1 — The extensively damaged automobile from which the patient was thrown.



Figure 2 — Spiral, open fracture of the left tibia and fibula.



Figure 3 — Classical anterior (obturator) dislocation of the right hip.

Laceration on the medial aspect of the right elbow was present. Palpation of the thoracic cage revealed definite bone crepitus, with respiration diagnostic of multiple rib fractures. Deep pressure on the pubic bones produced severe pain indicating probable fractures, later confirmed by X ray. The right and the left frontal sinus were opened by large punctate wounds. These cavities were filled with grass and dirt.

The patient was placed in a single room on a movable stretcher. Adequate help was assembled, including one nurse who was assigned to the patient for the night. His clothes were cut off. Blood for typing was drawn immediately and intravenous saline started. Plasma was promptly added and then a total of 2,000 cc. of whole blood was given. Nasal oxygen was administered. The patient became more responsive, his blood pressure returned and rose to 100/60. The pulse dropped to 100 and his skin became warm and dry. A #16 Foley catheter was passed easily, and grossly bloody urine was obtained. Therefore, the catheter was left in place. Small doses (10 mg) of morphine were given intravenously to control restlessness.

As the patient's condition responded it was decided to attempt to carry out definite treatment. The operating room was alerted, anesthesia arranged and necessary help called in. At 7:00 A.M. the patient was taken to the X-ray department on his way to the operating room. Only simple X rays (pelvis, legs, and right arm) were done.

Under general (cyclopropane) anesthesia, all wounds were cleansed and closed. The right hip was reduced. The left lower leg was aligned and placed in plaster.

The patient was then returned to the ward. The left humerus was treated by traction. ENT, neurosurgical, and G.U. consultations were promptly obtained. Antibiotics and tetanus antitoxin were given. A right foot drop was treated by a posterior plaster shell.

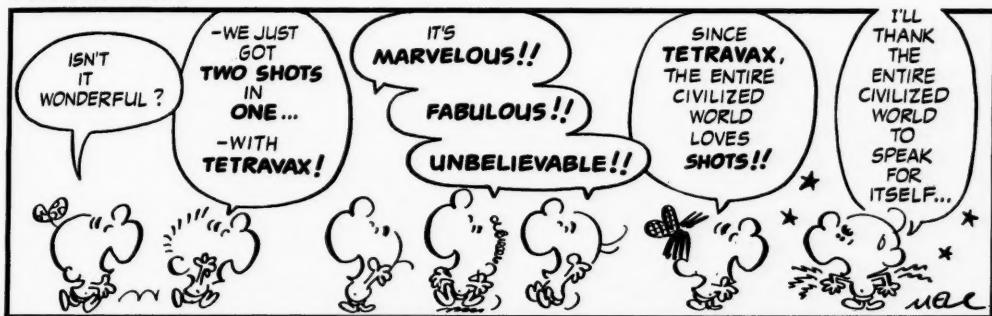
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Figure 4 — Transverse fracture of the left humerus.

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MANAGEMENT OF MULTIPLE INJURIES

concluded from page 582

The patient did well until his sixth day when he developed classical signs and symptoms of a massive pulmonary infarct. Medical and surgical consultations were obtained, and anticoagulant therapy was agreed upon, despite the risks of urinary or occult intra-abdominal bleeding. Therefore, Heparin was the drug of choice because of its immediate reversibility with Protamine Sulfate. Fresh blood was kept available on the floor as was the Protamine. His course thereafter was benign and he was discharged on his 47th hospital day to the clinic. Some months later he developed a bladder calculus requiring surgical removal. It is now two years post-injury. The patient is asymptomatic and planning to enlist in the armed services. Final X rays reveal solid fracture healing and a viable right femoral head (Figures 5, 6, 7).

SUMMARY AND CONCLUSION

Injury and trauma are increasing. Every physician, whether a specialist or not, should comprehend the basic established principles of care of the injured, and have a sound program to follow. These must be adaptable to the changing situations that may occur.

Here at the Rhode Island Hospital our teaching centers on a program which highlights the patient's immediate survival, with later attention to the definite handling of fractures and soft tissue injuries. Reference is made to the necessity of close teamwork between various departments, the need of



Figure 5 — At two years there is solid healing of the left tibia.

RHODE ISLAND MEDICAL JOURNAL

rapidly available help, emergency splinting and measures to combat shock.

If a carefully planned program is followed, with improvisations and changes made as necessary, our results can only improve.

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Figure 6 — Solid healing of the humerus taken at two years after injury.

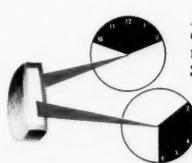


Figure 7 — Normal appearance of the right femoral head at two years after injury.



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RHODE ISLAND VOLUNTARY PLANS LEAD NATION IN ENROLLMENT OF CITIZENS OVER AGE OF SIXTY-FIVE

NINE OUT OF TEN of the self-supporting Rhode Islanders age sixty-five and over are enrolled in Blue Cross, according to a research report released recently by the Rhode Island Blue Cross and Blue Shield (Physicians Service) Plans.

The study disclosed the following facts:

1. The Rhode Island Plans have the highest percentage of enrollment in the nation among oldsters, with 93.4 per cent in Blue Cross and 77 per cent in Blue Shield.
2. A higher percentage of people sixty-five and over are enrolled than those under age sixty-five.
3. Oldsters go to the hospital much more often, and stay much longer, than younger people — a recognized theory supported clearly by the report.
4. Older members select and pay for higher Blue Cross benefits the same as younger people.
5. The use of hospital care increases with the amount of protection provided by Blue Cross — the higher the benefits, the greater the use.

The research study was prepared by Edgar H. Clapp, associate director of Blue Cross-Blue Shield, and was compiled from the records of 265,000 Blue Cross contracts covering 645,000 members. The 1960 United States census reports and records of the State Department of Social Welfare were also included in the study.

"Actually, Blue Cross and Blue Shield have done a better job of enrolling oldsters than it has enrolling younger people," Stanley H. Saunders, executive director, commented. The report showed that 79 per cent of those under sixty-five had membership, compared to 93.4 per cent of those age sixty-five and over.

Mr. Saunders attributed the high percentage of enrollment among oldsters in Rhode Island to the fact that the local plan has pioneered in making membership available to persons over sixty-five through special company-sponsored retiree groups and open enrollment programs, as well as allowing members leaving a group to continue on a direct payment basis regardless of age.

"The importance of the age factor in the use of hospital care was clearly evidenced by the report," Mr. Saunders pointed out. "On the average, a person over eighty years old will use almost four times as many days of hospital care as a person under forty, and three times as many days as a person

under sixty-five."

The number of hospital admissions and the average length of stay in the hospital also increases with the age of the member. The average person over age sixty-five goes to the hospital more than twice as often and stays more than twice as long as a person under twenty-five according to the report.

"However, Blue Cross has never segregated the oldsters and charged them a higher rate because of their greater use of hospitalization as a group," Mr. Saunders said. "Instead, the experience of all age groups has been blended so that protection can be made available on a voluntary basis for our senior citizens at a reasonable cost."

In general, oldsters select and pay for the higher cost membership the same as younger people, according to the report. For instance, the proportion of members selecting the \$20 Blue Cross Plan who are sixty-five or over was approximately the same as those selecting the lower benefits and lower cost plans.

"This would indicate that the cost of Blue Cross membership is not a deterring factor for oldsters any more than it is for younger people," Mr. Saunders commented.

Approximately one third of the members sixty-five and over are included in group plans, and two thirds pay direct to Blue Cross. Mr. Saunders explained that group memberships are available when the company provides for retirees through a company group, such as the program recently announced by the State of Rhode Island for active and retired employees.

Another fact revealed by the comprehensive study was that the use and length of stay in the hospital increased in proportion to the benefits provided under the membership. For example, subscribers with the \$20 Blue Cross Plan went to the hospital almost twice as often, stayed slightly longer, and used twice as many days of hospital care as subscribers under the \$8 Blue Cross Plan.

"In short, Blue Cross has enrolled a higher percentage of oldsters than younger people, and leads the nation in this respect. Oldsters use the hospital more, stay longer, and in general select the same types of benefits as younger people. And the higher the benefits, the greater the use of hospital care," Mr. Saunders summed up.

RHODE ISLAND PLANS LEAD NATION
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Statistics for Physicians Service, the Rhode Island Blue Shield Plan, showed trends and utilization of services similar to the Blue Cross report. The Blue Shield study included 231,000 contracts covering 567,000 members.

Mr. Saunders concluded that the extensive research report should have particular significance in the health economics field since the Rhode Island Blue Cross represents 80 per cent of the total eligible population in the state, and Blue Shield represents 70 per cent. Both records lead the nation in the percentage of population enrolled.

**DIAGNOSIS AND MANAGEMENT OF ACUTE
 SMALL BOWEL OBSTRUCTION**

concluded from page 563

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**EXPERIMENTAL USE OF CARDIOPLEGIC
 AGENTS IN OPEN-HEART SURGERY**

concluded from page 571

PAPA, R.N. from the Cardio-pulmonary Department of the Miriam Hospital is greatly appreciated.

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Wednesday, November 2. Kenney Clinic Day. Memorial Hospital, Pawtucket (all day).

Monday, November 7. Providence Medical Association meeting. Medical Library (8:30 P.M.). Speaker: MARK ALTSCHULE, M.D.

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THROUGH . . . the Microscope



739,000 Rhode Islanders Possess Health Insurance

The number of persons in Rhode Island with health insurance reached a new high of 739,000 at the end of 1959, the Health Insurance Institute reported recently. This was an increase of 4.7 per cent over the 1958 year-end total.

The report was based on the 14th annual Health Insurance Council survey of health insurance coverage in the U.S., which revealed that nearly 128 million Americans, or 72 per cent of the total civilian population, were protected by health insurance as of December 31, 1959.

The survey of reports from insurance companies, Blue Cross-Blue Shield and other health care plans, disclosed that the number of persons in the state with hospital expense insurance increased by 33,000 during the year to reach a total of 739,000 at the end of 1959.

The number of persons with surgical expense insurance climbed from 597,000 at the end of 1958 to 655,000 at the end of last year. Persons protected by regular medical expense insurance, which helps pay for doctor visits for nonsurgical care, increased from 556,000 to 615,000.

Blue Plans Win Approval of 56% of Federal Employees

At least 1,450,000 employees have enrolled in the Federal employees health benefits program according to preliminary and incomplete registration figures received from 35 of the 38 carriers of participating health benefit plans, the Civil Service Commission announced today. The new program went into effect early in July.

The enrollment figures are based on the number of registration forms received by participating carriers by the close of business July 15. Because on that date all registration forms had not yet been processed by Federal agencies and received by the carriers, final figures on employee enrollment will not be available for another two or three weeks, the Commission said. Figures on the number of employee dependents enrolled will also be available at a later date.

The 1,453,600 preliminary enrollment figure breaks down as follows: Government-wide Service Benefit Plan (Blue Cross-Blue Shield) — 805,000, or 56 per cent of total enrollment received; Government-wide Indemnity Benefit Plan (Aetna Life Insurance Company) — 400,000, or 27 per cent of the total; Federal employee organization plans — 159,400, or 11 per cent of the total; and comprehensive medical plans — 89,200, or 6 per cent of the total.

According to samplings made of the four categories of plans offered, selection of high and low options were: Government-wide Service Benefit Plan — 82 per cent high and 18 per cent low; Government-wide Indemnity Benefit Plan — 82 per cent high and 18 per cent low; employee organization plans — 60 per cent high and 40 per cent low, and comprehensive medical plans — 85 per cent high and 15 per cent low.

The new program, which is administered by the Commission's Bureau of Retirement and Insurance, was authorized by the Federal Employees Health Benefits Act of 1959. It is a voluntary, contributory health benefits program with the Federal government paying up to one-half the cost of the subscription charges and employees paying the remainder through payroll deductions.

Regular TV Channels to Carry Weekly Medical News Review

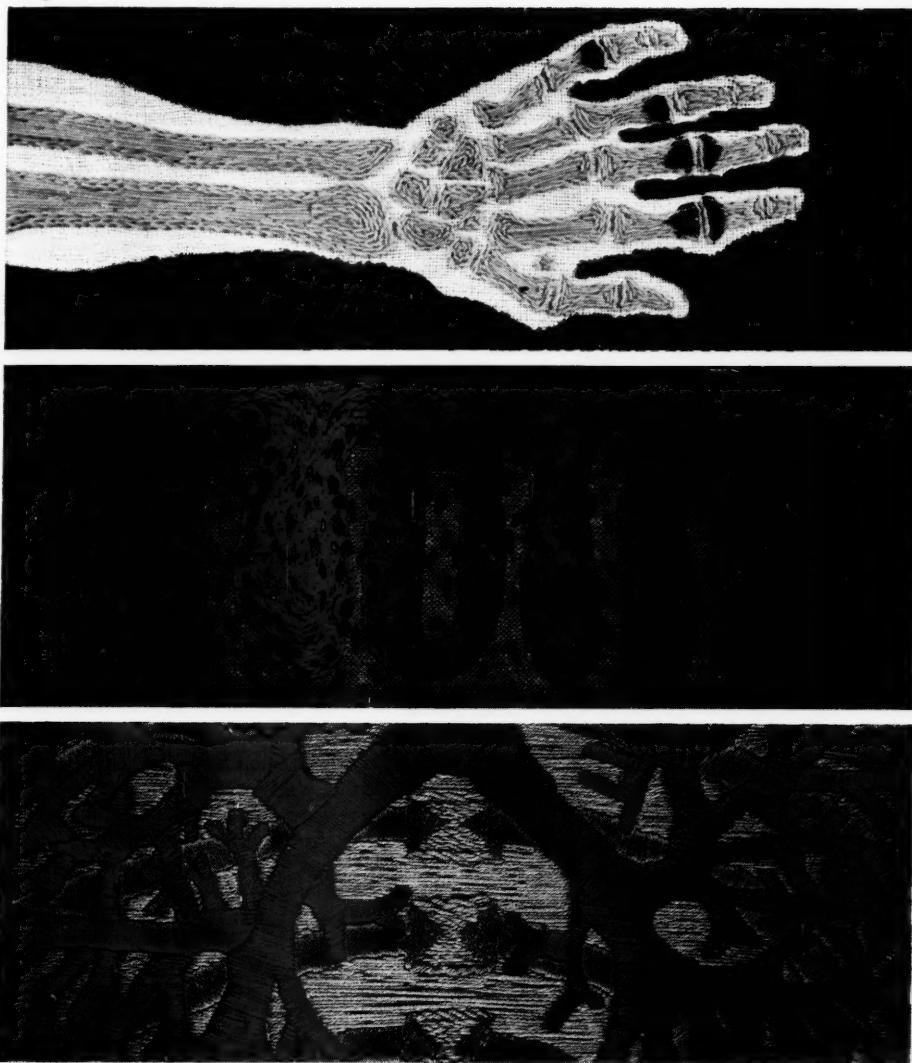
A weekly review of medical news for physicians, using regular commercial television channels, will go on the air October 30 over a nationwide network, Medical News Inc. of New York City, announced recently.

The fifteen-minute program, *This Week in Medicine*, will be broadcast on Sunday afternoons. The selection of the broadcast time was based on preferences expressed by physicians in cities where the program was tested with the co-operation of county medical societies.

Tests in four cities — Dallas, Kansas City, Miami and Binghamton — showed that even

continued on page 592

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THROUGH THE MICROSCOPE

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though *This Week in Medicine* could be seen by the public over regular channels, the technical language and subject matter limited the audience to physicians and members of allied health professions.

Using video tape and film, each program will include a world-wide summary of medical news and a filmed feature on some aspect of research, clinical medicine or surgery. It will mark the first use of regular television channels to reach a nationwide medical audience on a professional level.

The series will be sponsored by CIBA Pharmaceutical Products Inc., and produced by the editorial staff and medical consultants of MEDICAL NEWS. News will be gathered by the MEDICAL NEWS network of contributing editors and correspondents in this country and abroad. As in the biweekly newspaper, also sponsored by CIBA, the news and feature content will be controlled by the editorial staff and medical consultants independently of the pharmaceutical company.

The program will also complement MEDICAL NEWS in giving the highlights of major scientific meetings and in calling the attention of physicians to important editorial content of scientific journals.

Information on prescription pharmaceutical products will be given in scientific terms and will be confined to pharmacological properties. Clinical

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indications for use of CIBA drugs will not be cited, but will be made available to physicians through normal channels. Nonprescription drugs will not be mentioned.

Sports Injury Conference to be Held During A.M.A. Clinical Session

The Second National Conference on the Medical Aspects of Sports sponsored by the American Medical Association, under the auspices of the A.M.A. Committee on the Medical Aspects of Sports, will be held in Washington, D. C., at the Statler Hotel on November 27, 1960. The conference will immediately precede the annual Clinical Meeting of the American Medical Association, November 28 — December 1, 1960.

As was true of the first meeting on this subject at Dallas, Texas, in November, 1959, the second conference will cover a wide range of subjects. Included will be papers, panels, and discussions relating to training and conditioning, prevention of injuries, recognition referral and treatment of injuries, the psychology of sports participation and other subjects.

Those interested in receiving announcements concerning the conference should address the secretary, Committee on the Medical Aspects of Sports, American Medical Association, 535 North Dearborn, Chicago 10, Illinois.

Prescription Drug Industry Reports on Funds for Research

The prescription drug industry disclosed last month that it spent 197 million dollars on research and development last year in the biggest privately financed assault on ill health in history.

The expenditure — 16 per cent higher than in 1958 — amounted to 7.8 per cent of the companies' pharmaceutical sales of more than 2.5 billion dollars.

Doctor Austin Smith, president of the nationwide trade association of 140 ethical drug firms, hailed the expenditure as "a typically American example of the force of private enterprise at work for the betterment of humanity."

Doctor Smith said his organization has completed the third annual survey of research activities of the industry in co-operation with the National Institutes of Health. It disclosed, among other facts, the following:

Drug industry research spending in 1959 was 7 million dollars more than the companies estimated a year ago that it would be.

Over 18 million dollars of the total was spent outside of pharmaceutical house laboratories in the form of grants and contracts to medical schools, hospitals, research institutes and other institutions.

An estimated 100,200 chemicals, compounds and

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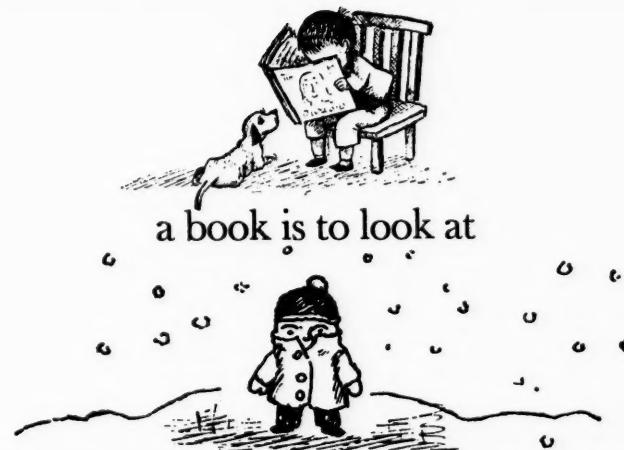


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THROUGH THE MICROSCOPE

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other substances were prepared, obtained and biologically tested by the industry in 1959 in its search for new and more specific medicinals.

Of these substances, 36,600 were in the field of cancer chemotherapy. The second heaviest concentration was 28,200 substances pertaining to allergies and infectious diseases.

The 140 producer members of the Pharmaceutical Manufacturers Association, responsible for more than 95 per cent of ethical drug production in the United States, estimate research and development spending of 214 million dollars in 1960.

PG Course on Diseases of the Chest Scheduled for November

The Council on Postgraduate Medical Education of the American College of Chest Physicians has announced a course on *Recent Advances in the Diagnosis and Treatment of Diseases of the Heart and Lungs* to be held at the Park-Sheraton hotel in New York City, November 14-18. Tuition for each five-day course will be \$100, including round-table luncheon discussions. The course was arranged under the co-chairmanship of Doctor Edgar Mayer, clinical professor of medicine, New York University Postgraduate Medical Center; Doctor Alfred S. Dooneief, lecturer in medicine, Columbia University College of Physicians and Surgeons; and Doctor Emil A. Naclerio, chief, thoracic surgical services, Harlem and Columbus hospitals, New York City.

Rhode Island Fourth in State Enrollments for Health Insurance

Fourteen states now have more than 75 per cent of their population covered by health insurance, the Health Insurance Institute reported recently.

New York State, with a coverage figure of 90.7 per cent based on more than 15 million insured residents, leads all 50 states. The Institute said other states in the 75 per cent or higher group are Connecticut (88.0), Pennsylvania (87.0), Rhode Island (86.3), Ohio (85.8), Vermont (85.0), Illinois (81.3), Missouri (79.9), Michigan (79.3), Massachusetts (79.0), Minnesota (78.3), Indiana (77.7), Delaware (77.1), and Colorado (76.3).

There are 29 states which have between 50 and 75 per cent of their populations covered by health insurance, and seven states which have less than 50 per cent of their residents so insured, said the Institute.

On a regional basis, the nine Northeast states of New York, New Jersey, Pennsylvania, Connecticut, Massachusetts, Rhode Island, Vermont, New Hampshire and Maine boasted the greatest percentage of population with health insurance, 84.5 per cent, based on 37 million insured persons out of the region's total population of 44 million.

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*Coan, J. P., McAlpine, J. C., and Boone, J. A.: J. South Carolina M. A. 51:417 (Dec.) 1955.

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THROUGH THE MICROSCOPE

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The Midwest followed with 78.1 per cent coverage based on almost 41 million persons with health insurance out of 52 million population in the 12 regional states of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska and Kansas.

West Third: The West ranked third with 66.3 per cent. More than 17 million persons have health insurance out of the better than 26 million persons living in the 13 states of Montana, Idaho, Wyoming, Utah, Colorado, Nevada, New Mexico, Arizona, Washington, Oregon, California, Alaska and Hawaii.

The South had 60.0 per cent coverage with more than 32 million insured persons out of the 54 million residing in the 16 regional states of Delaware, Maryland, Virginia, West Virginia, Kentucky, North Carolina, South Carolina, Tennessee, Florida, Georgia, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma and Texas.

At the close of last year, 127,896,000 persons (4.8 million more than at the end of 1958) had health insurance for a national health insurance coverage figure of 72 per cent, said the Institute.

From 1958 to 1959, all four regions showed an

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increase in the number of insured persons with the South leading the way. The South gained 1.6 million covered persons while the Midwest's total increased by 1.2 million, the West's by 1.1 million and the Northeast by .9 million.

One of the nation's newer states, Alaska, had the lowest coverage figure, 31.0 per cent, which, however, was up from the 1958 figure of 24.6 per cent. Hawaii's coverage figure was 45.9 per cent, said the Institute.

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- That an analysis of claims paid by group health insurers shows that 18 per cent of all surgical claims, excluding maternity, were for the removal of tonsils.

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BOOK REVIEWS

YOUR HEART: A Handbook for Laymen by H. M. Marvin, M.D. Doubleday & Co., Inc., Garden City, N. Y., 1960. \$4.50

This moderately priced (\$4.50) book of 335 pages is a reliable and remarkably complete source of information about the heart for laymen. There are 26 chapters and the titles of those containing more than 10 pages are as follows: *Irregularities of the Heart; Hypertension; Congestive Heart Failure; Angina; Heart Attack; What Causes Coronary Sclerosis?; Anticoagulants; Stress and Strain; Obesity; The Electrocardiogram; Patients and Doctors*. Many other topics are discussed in the shorter chapters, and throughout there is a lively seasoning of medical history and brief summaries of some of the major medical articles on which current concepts of medical or surgical opinion and treatment are based. In general, this reference material is wisely chosen and supplemented by comments based upon the author's own wide and perceptive experience.

The general tone is one of optimism without retreat from honesty, and through the pages shines the author's obvious interest in his patients as human beings, with their weaknesses, follies, and foibles, but also with their frequent examples of unquenchable courage. Doctor Marvin gives both sides of controversial questions but does not hesitate to give us his opinion. For example, contrary to Doctor Paul D. White, he is unconvinced of the value of exercise in preventing coronary artery disease and, admitting his personal bias, takes delight in quoting Santayana, "The need of exercise is a modern superstition, invented by people who ate too much and had nothing to think about."

Here then is a book by a wise and friendly physician, an astute observer of human beings and one who has clearly enjoyed and been enriched by his nonmedical reading. Laymen can read this book with confidence and benefit, though not without some mental effort, eased somewhat by an excellent glossary of terms at the end of the book. There is something of value to be derived by physicians, too, in browsing through this book and most of us would be wiser and more tolerant after reading in detail the chapter on *Patients and Doctors*.

FRANK B. CUTTS, M.D.

DISEASES OF THE NAILS by V. Pardo-Castello and O. A. Pardo, Charles C Thomas, Springfield, Ill., 1960, 3d edition, pp. 277, 113 illustrations, \$8.50.

This is the third edition of a classic. It is remarkable how the authors have succeeded in condensing so much material in a relatively small book, devoted to an important, although limited, branch of dermatology. Notable additions have been made to anatomy, histology, histopathology, chemical composition and the rate of growth of nails.

In the chapter pertaining to affections peculiar to the nails, onychiae and paronychia of various kinds, bacterial and mycotic, are discussed. The indispensability of the laboratory in reaching a diagnosis is stressed. Details of technique for such examination are given.

The therapy of onychomycosis, almost hopeless a short while ago, has taken a most important step forward very recently, with the discovery of Griseofulvin. The large personal experience of the authors in this therapy is discussed at length.

Onycholysis resulting from nail base coats, and the improvement of the nail, parallel with the improvement of the hair in alopecia totalis following corticosteroid therapy, are mentioned. Tumors, onychodystrophies, congenital ectodermal defects, occupational affections, ungual symptoms due to drugs and poisons are discussed. Ungual disorders related to systemic diseases (psoriasis, eczema, syphilis, anemia, avitaminoses, endocrinopathies) should be of particular interest to the internist.

References number 462 and are international, making the book invaluable to the researcher.

The authors deserve to be highly commended for a fine piece of work.

F. RONCHESE, M.D.

FUNDAMENTALS OF CLINICAL HEMATOLOGY by Byrd S. Leavell and Oscar A. Thorup, Jr. W. B. Saunders Co., Phil., 1960. \$10.00

This book encompasses the field of present-day hematology in 481 pages, and is thus a good deal smaller than most standard textbooks in the field.

A brief first chapter deals with basic morphology and chemistry leaving more details to standard texts in physiology and biochemistry. Chapter 2 is an excellent review of red cell physiology and Chapter 3 deals with the classification, mechanism, and the diagnosis of the anemias. The next eight chapters cover the description of specific diseases and syndromes and the last chapter deals with techniques. There are excellent case reports illustrating the various disease entities described. The book is highly up to date. The authors have shown excellent judgment in what subjects to emphasize and which ones to play down. In consequence, the text makes pleasant reading and both the beginner and advanced student should find it instructive and refreshing.

If one were to look for flaws, it would be that there are few illustrations, particularly when it comes to blood and bone marrow morphology. Since excellent atlases on morphology are available, this should not be too much of a drawback.

This book is highly recommended.

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William L. Mauran, Jr., M.D.

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Thomas Murphy, M.D.

Maternal Health Committee

John G. Walsh, M.D.
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INTERIM MEETING
of the
RHODE ISLAND MEDICAL SOCIETY
Wednesday, November 9, 1960

AT THE SQUANTUM CLUB
EAST PROVIDENCE, RHODE ISLAND

Program

3:00 P.M. Panel Presentation

"SURGICAL-MEDICAL MANAGEMENT OF THE AGED"

Moderator:

RICHARD J. KRAEMER, M.D.
of Greenwood, Rhode Island
Secretary, American Geriatrics Society

Panelists

WILLIAM H. HARRIDGE, M.D.
of Chicago, Illinois
Clinical Assistant Professor of Surgery, University of Illinois College of Medicine; Associate Attending Surgeon, St. Francis Hospital, Evanston, Illinois.

THOMAS H. McGAVACK, M.D.
of Martinsburg, West Virginia
Intermediate Service, VA Center, Martinsburg; Professorial Lecturer, George Washington University School of Medicine; formerly member of Medical Faculty at University of California, Associate Professor of Medicine, and Professor of Clinical Medicine, New York Medical College; Director and Past President, American Geriatrics Society.

EDWARD HENDERSON, M.D.
of Bloomfield, New Jersey
Editor-in-Chief, *Journal of the American Geriatrics Society*; Director and Past President of the Society.

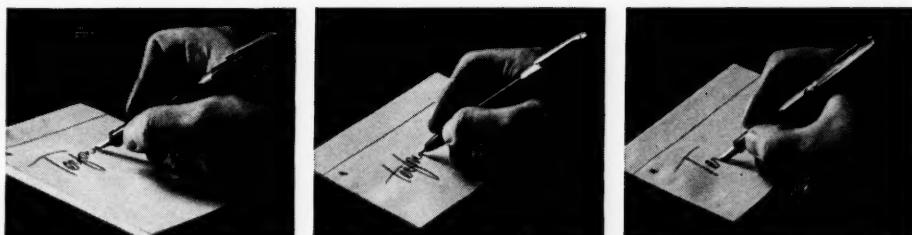
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5:30-6:30 P.M. Social Hour and Reception

6:30 P.M. Dinner at the Squantum Club



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THE WASHINGTON SCENE

A Summary of Congressional Legislative Action Prepared by the Washington Office of the American Medical Association.

WASHINGTON, D. C.—The federal government is offering states liberal matching funds to provide health care for needy and near-needy persons sixty-five years of age and older.

The program, which Congress approved in the bob-tailed post-convention session, is supported by the American Medical Association and allied health groups.

Congressional approval of the federal-state program marked a victory for the medical profession and a defeat for Democratic Presidential Nominee John F. Kennedy, the AFL-CIO and other advocates of the Social Security approach to the problem.

In a key vote on the issue, the Senate rejected by a 51-44 vote a Kennedy proposal that would have provided hospitalization and medical care for the aged under the Social Security system. The Kennedy plan would have required an increase in payroll taxes.

Republicans and Southern Democrats joined in the Senate to defeat the Social Security approach which was opposed vigorously by the medical profession.

After voting down the Kennedy plan and a separate proposal of the Eisenhower Administration, the Senate passed a modified version of a House-approved program. The modifications, sponsored by Senator Robert S. Kerr (D., Okla.) and others, provided for increases in the percentage of federal matching funds and for administrative changes designed to facilitate state participation.

Under the legislation as signed into law by President Eisenhower, (1) substantial increases are authorized in federal grants to states to help with health care expenses of the 2.4 million persons on old age assistance rolls, and

(2) Federal matching funds are offered the states to finance a new program of health care for an estimated 10 million aged persons who are not on relief but whose incomes may be inadequate to take care of all their health costs.

Start of the program was authorized for October 1 for those states where new state legislation is not required.

Administration of the program rests entirely

with the states, subject to Federal approval in broad terms. It is up to each individual state whether it participates. Eligibility standards for beneficiaries and what health care services are provided are matters for the states to decide.

If a state so chooses, it can take care of all the health needs of an eligible beneficiary. The law authorized in-patient hospital services; skilled nursing home services; physicians' services; outpatient or clinic services; home care services; private duty nursing services; physical therapy and related services; dental services; laboratory and X-ray services; prescribed drugs, eyeglasses, dentures and prosthetic devices; diagnostic screening and preventive services, and any other medical care or remedial care recognized under state law.

For medical expenses of persons on old age assistance rolls, the federal government will contribute 50 to 80 per cent—with states with low per capita income getting the larger percentages of federal aid—of an amount equal to \$12 multiplied by the number of old age assistance recipients in a particular state.

The matching formula will be the same for financing the health care of the near-needy but there is no \$12 limitation figure.

Health, Education and Welfare officials estimated first-year costs of the program at \$262 million—\$202 million federal and \$60 million state. Annual costs are estimated to rise by the end of the fifth year to \$340 million federal and \$180 million state. However, these estimates admittedly are no more than educated guesstimates because so much depends upon state action.

It was estimated that maximum participation and a state contribution of \$896,000 would bring Rhode Island \$1,381,000 in federal matching funds in the first year of the program.

The medical-care-for-the-aged legislation was included in an omnibus measure titled Social Security Amendments of 1960. It also eliminated the age 50 requirement for eligibility for disability insurance benefits.

The Senate knocked out of the House bill a provision that would have brought physicians under Social Security coverage.